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# Skeptical Inquirer

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## DNA and Evolution in Action

Sean B. Carroll

## 30 Years of the Skeptical Inquirer

Paul Kurtz

## The Brain and Belief

## Science after Stem-Cell Fraud

## Predicting Earthquakes

## Star Naming Silliness

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**On the cover:** The douc langur monkey (Pygathrix nemaeus nemaeus) has evolved a specialized gut for ruminating leaves. The bloodless icefish, discussed in Sean B. Carroll's article on page 39, is another example of evolution in action.

# Editor's Note

## *The Vigorous Science of Evolution*

I received a letter the other day that got me thinking. "I've often wondered why there is no tolerance amongst evolution proponents for those espousing intelligent design/creationism," it began. The writer claimed that "some well-known evolutionary scientists" had "sunk to new lows in their attacks on ID/C believers." And he said that as he pondered evolution he had some questions. His basic question: As a mass of cells supposedly crawls out of the primordial soup, "How did this organism know it needed lungs and how did it know what lungs were and how did it know how the lungs should be developed? The same goes for eyes, legs, arms, brains, etc. etc. et al."

I sighed. I was about to toss his missive but then gave it second look. His tone was thoughtful, not angry. I decided to try to answer. To his first question, I began, "All these things have been explained countless times by evolutionary biologists." I told him that may explain their seeming impatience when they encounter another round of creationists' "hackneyed, debunked, long-proven-wrong ideas." Though true, I doubt if that pleased him. As to his second question, I did my best. "Evolution doesn't require an organism or its components 'needing to know' anything," I began. I then tried to explain a bit about how evolution, "an enormously creative process," actually works over time.

I don't know if the letter writer, who acknowledged being a believer in intelligent design/creationism, was open to my attempt to answer. I hope so. I told him I hoped that those like him who distrust evolution would at least "read up a little bit from any good popular science book about evolution." I gave him a dozen examples.

But it got me to realizing how important it is for evolutionary biologists to write for the general public. Stephen Jay Gould was a master; so is Richard Dawkins. But we need more working scientists to go beyond their research and explain evolution. We need them to share with the public the exciting new discoveries in their field, so people understand that evolutionary scientists aren't defending a stodgy ideology but doing vigorous, cutting-edge science.

Sean Carroll is one of a new breed of biologists doing just that. A professor of genetics at the University of Wisconsin and an investigator at the Howard Hughes Medical Institute, Carroll is about to publish his second book on evolution in a year. We excerpted the first, on the evolution of form, in our special issue on Evolution and the ID Wars (November/December 2005). In this issue the lead article, "The Bloodless Fish of Bouvet Island," is from his forthcoming book The Making of the Fittest: DNA and the Ultimate Forensic Record of Evolution. I think you will enjoy it.

I asked Sean how he could possibly have a second book coming out so soon after his first. "I realized I was pregnant with two books as Endless Forms Most Beautiful was wrapping up, and I just kept writing," he answered. "I felt there were so many new strong stories unfolding from the DNA record that I should tell them."

* * * *

This is our 30th anniversary of the SKEPTICAL INQUIRER. CSICOP founder and chairman Paul Kurtz in this issue provides an extensive personal review of SI over those thirty years. Longtime readers may enjoy recalling with Paul many familiar moments; I hope new readers will be entertained and gain some new perspective. Your reactions are invited.

Skeptical Inquirer

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BRIAN HART

Psychic detective. The very phrase conjures up an image of Peter Falk as Columbo, wearing his trademark rumpled raincoat, albeit with a dowsing rod in place of his ever-present cigar.

Reality is another story. The Independent Investigations Group (IIG), in Los Angeles, went in search of a self-described psychic detective named Carla Baron. On her Web site, she makes many specific claims about working on such high-profile cases as those of O.J. Simpson, JonBenet Ramsey, Elizabeth Smart, and others. It was because of the specific nature of her claims that the IIG thought her worthy of our attention.

A group of IIG members recently attended an all-day Learning Annex seminar called "The Three Psychics." We sat through the first two psychics, who gave very general and vague readings with lots of doses of "feel-good-about-yourselves" New Age advice. Carla Baron got up last, and started naming names and specifics about police cases that she claims to have worked on. When the audience pressed her for details, she would readily comply with names of victims, family members, state-police-department names, cities, etc. We took careful notes.

Coincidentally, three IIG members were randomly called to the front of the room for "personal readings" from Carla. A computer consultant fed her the false scenario that he was a screenwriter, and she went into quite an elaborate and detailed story about what he was to expect from his soon-to-be-successful (nonexistent) screenplay. She told another IIG member that he would form his own company and produce a "product or a service," and even told the executive director of CFI/West that his boss was "stealing all the company profits and was under IRS investigation." She also told him that he would soon have a job as a television sportscaster.

Despite the fact that we had all shaken Baron's hand and sat no more than three feet from her while she did her "readings," she never picked up on the fact that none of us were who we claimed to be. If this is how well her psychic powers work at close range, I can't imagine how she "reads" over the phone. Since we were already suspicious of her, starting even with her supposed "credentials," we actually fell more into the role of Columbo, as we were able to question her and listen carefully and critically to her answers.

Armed with fourteen specifically named cases, the IIG went to work on this matter the old-fashioned way. Our lead investigator, Owen Hammer, spent several months tracking down and calling police departments and official spokespersons for victim's families. He even attended a second session with Baron to gather more information.

We found generally that if the policemen in question had heard of Carla Baron, it was because Carla had contacted family members and convinced them to call the police with her psychically derived leads. With one or two exceptions, the policemen we spoke to were either polite in saying, "We have to investigate all leads," or laughed directly at the question of "Do you ever use a psychic in your detective work?" One young police officer in Pennsylvania, working on his first major missing-person case, firmly believes that Baron has given him "some great leads," despite the fact that this particular case is still unsolved four years later.

All in all, we found that of the fourteen cases we looked at, some had been solved by standard police "shoe-leather" detective work, and the rest remain unsolved to this day.

The IIG has put all this information onto its own Web site (www.iigwest.com) and sent out over 100 press releases. Almost immediately, we heard from two organizations that help track missing children and adults. One of them, the ChildSeek Network (at www.childseeknetwork.com), instantly changed its Web site to remove any positive links to Carla Baron, and the other one thanked us for posting accurate information on Baron and her "cases."

Cindy, a representative from angelsmissing.com told us:

> I cannot tell you how many of these people prey on the missing families and loved ones. . . . People in these situations will believe whatever you tell them, as they are so vulnerable. This is why hundreds of missing person's families and loved ones lose money to these kinds of people. It saddens me—they are so disappointed in the end. I wish more families of the missing could see [the report].

Carla Baron, psychic detective? Not this time. Give Lt. Columbo back his cigar, take away the dowsing rod, and let him start acting like the smart cop we always knew he was.

Brian Hart is one of the founding members of the Independent Investigators Group (IIG) in Hollywood, which has investigated many claims of the paranormal since 2000.

Susan Polk, a self-proclaimed psychic, was convicted on June 16, 2006, of second-degree murder. Polk, 48, was arrested in October 2002 when her husband Felix was found stabbed to death in their Orinda, California, home. Polk initially denied any involvement in her husband's death but later claimed she stabbed her seventy-year-old husband in self-defense.

The lengthy trial was rife with pseudoscience and paranormal elements, involving psychic powers, conspiracy theories, recovered memories, and even Satanic Ritual Abuse. Polk accused her dead husband of daily physical abuse, poisoning the family dogs, brainwashing their sons, and plotting the 1978 assassination of a San Francisco mayor; she also accused everyone from the judge to the court reporter of conspiring to convict her. Two of Polk's three sons testified against her, claiming that she was delusional and had spoken of trying to kill their father several times.

Prosecutor Paul Sequeira suggested that Polk suffered from a persecutory delusional disorder. Linda Barnard, a therapist who briefly examined Polk and testified on her behalf, found no indication that Polk was delusional, out of touch with reality, or an unreliable historian, despite the fact that Polk claimed to be psychic, had prophetic dreams that revealed former Secretary of State Colin Powell was the Antichrist, and had predicted the September 11, 2001, attacks. "Some people really are psychic," Barnard said. "I don't know if she is or isn't. If she is, that would be a big burden to carry." Barnard admitted that her assessment was meant to determine whether Polk had been abused, not whether she was delusional.

Like comedienne Roseanne Barr and others, Polk claimed to have recovered memories of sexual abuse by her parents and that she watched her parents murder and bury a police officer in their basement. She also claimed to have vague recollections of her husband putting her into hypnotic trances and forcing her to use her psychic powers to make predictions. She believed that these predictions—including information about terrorism attacks—were shared with Israeli intelligence agencies.

Polk felt that the fact that she claimed to be psychic was being used by the prosecution to discredit her. Serving as her own lawyer, Polk called an alleged psychic detective to the stand in an attempt to bolster her own credibility

# Update: Charges against Ontario 'Healer' Dropped

In the September/October 2005 issue of the SKEPTICAL INQUIRER, we reported the arrest on June 14, 2005, in Toronto, Ontario, Canada, of self-proclaimed "psychic healer" Alex L. Orbito and an accomplice, John Robert Wood, for fraud over $5,000 and possession of the proceeds of crime. The arrest was made following a three-day "healing spree" at a hotel in Scarborough, Ontario. Over the course of those three days, Orbito made an estimated C$80,000 in 200 to 500 "healing sessions" that were arranged by Wood. But on January 20, 2006, the Canadian government withdrew the charges against both men.

Orbito, a Filipino, and Wood, a resident of Pickering, Ontario, were scheduled to stand trial in July, according to an article that appeared in Canada's National Post on May 17, 2006. Brendan Crawley, a spokesman for Ontario's Ministry of the Attorney-General, is quoted as saying, "The decision by the Crown to withdraw charges against Messrs. Wood and Orbito was based on the assessment that there was not a reasonable prospect of conviction." He did not add why it was believed that the case wouldn't stand up in court.

Detective Michael Barsky, who supervised the investigation, reported at the time of the arrests that Wood used a claim that Orbito had cured Wood's wife of cancer to persuade people to pay for Orbito's services. It was reported that investigation had revealed that Wood's wife never had the disease, but Wood has since produced documents showing that she was treated for breast cancer surgically at a Toronto hospital—but not by Orbito's methods of healing.

Psychic surgeons such as Orbito claim to be able to reach into the bodies of their clients, removing diseased tissues and "negative energies" that cause their illnesses; skeptics counter that it's all done with animal blood and sleight of hand.

—Julie Lavarnway and David Park Musella

Julie Lavarnway is serving as an intern with CSICOP and the Center for Inquiry. David Park Musella is an editorial assistant with the SKEPTICAL INQUIRER.

as a psychic. Annette Martin, a self-described professional psychic detective, ghost hunter, and pet psychic, took the stand and told the jurors that she had helped police solve criminal cases. "The idea is to show that there is psychic phenomena and that people can predict things," Martin later told the press.

Contra Costa County Superior Court Judge Laurel Brady allowed the testimony but stated, "We're not here to determine if psychic ability exists. . . . [Martin] can testify as to what she does for a living and the jurors can take from it what they will." Sequiera argued against allowing Martin to testify: "If a psychic is going to testify and say, 'I am a psychic and I can see the future and I have solved cases with my psychic ability.' . . . The court would laugh me out of here if I called a psychic as a witness."

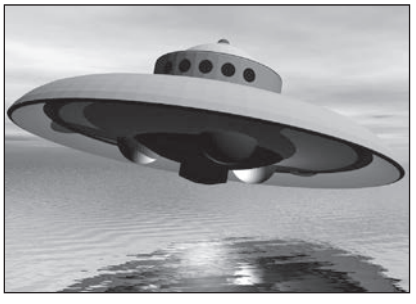
Some court watchers were concerned that Polk might find a way to turn the trial into a referendum on psychics, forcing a long legal debate about the validity of psychic phenomena and the paranormal in what is known as a Kelly-Frye hearing. According to Paula Canny, a defense lawyer, "A hearing on the validity of psychic phenomenon could be a judicial disaster." On the other hand, perhaps a full legal inquiry into the validity of psychic powers might do for psychics what Delaware Judge John E. Jones's recent decision about intelligent design did for creationists: bring the issue to a head and help settle the matter.

Prosecutor Sequiera stated that in his nearly quarter-century as a prosecutor, he'd never heard of a psychic testifying. Since Martin claims to speak to ghosts, Sequeira said, "There's one ghost in particular I'd like to talk to. He could shed some light on this case."

Apparently Polk's powers didn't foresee that her defense would fail miserably; instead of bringing credibility to the psychic profession, she became the latest psychic to be convicted of a felony.

—Benjamin Radford

Benjamin Radford is managing editor of the SKEPTICAL INQUIRER; his Web site is



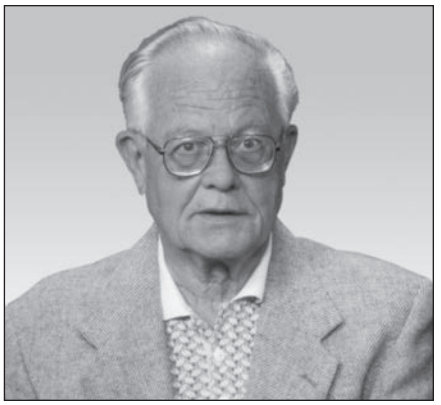
In 1952, then-Prime Minister Winston Churchill said, "What does all this stuff about flying saucers amount to? What can it mean? What is the truth?" A report that was completed in 2000 by the British Ministry of Defence (MOD) and now made public may at last answer Churchill's questions.

The MOD declassified the study in response to a request made under British freedom-of-information laws. That study, examining sightings of "unidentified aerial phenomena," or UAPs, concluded that flying saucers and other related objects, "In the absence of any evidence to the contrary," are the result of: "Mis-reporting of man-made vehicles, often observed by perfectly credible witnesses, but with unfamiliar or abnormal features; or in unusual circumstances"; "Reports of natural but not unusual phenomena, which are genuinely misunderstood at the time by the observer"; or "The incidence of natural, but relatively rare phenomena." The report notes that incidence of events in the latter category may be increasing due to "man-aided factors, such as smoke and dust." The sightings that were included in the data pool for the study were reported between 1987 and 1997.

The MOD, in its role as military protector of the United Kingdom, conducted the study primarily to determine if there were any discernible risks, but concluded that "There is no evidence that any UAP, seen in the [United Kingdom's airspace], are incursions by air-objects of any intelligent (extra-terrestrial or foreign) origin, or that they represent any hostile intent" and "There is no evidence that solid objects exist which could cause a collision hazard." The key recommendation of the MOD is that in light of the study, "It should no longer be a requirement for [the British intelligence services] to monitor UAP reports as they do not demonstrably provide information useful to Defence Intelligence."

However, the study did unexpectedly note the "relevance of plasma and magnetic fields to UAP." The study reports that atmospheric plasmic energy masses can take on many of the aspects of UFOs, including non-ballistic motion, "shadowing" aircraft, and, with possible military applications as decoys, the ability to sometimes mimic solid objects on radar.

—David Park Musella



## Author, Professor Vern Bullough Dies

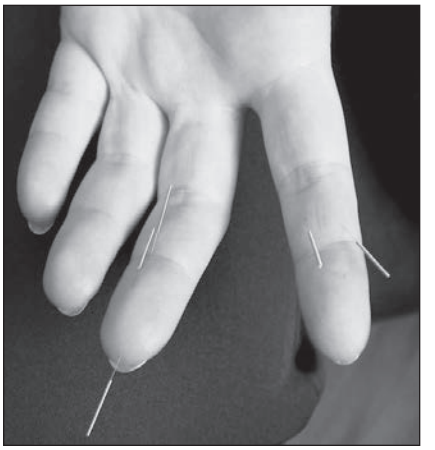
Scholar, author, and sexologist Vern Bullough died on June 21, 2006, after a brief illness. He was 78. He was a stalwart humanist and a dedicated member of CSICOP, the Council for Secular Humanism, and the Center for Inquiry. He had devoted himself to humane causes all during his life and was considered one of the leading authorities in the world on the history of sex and the nature of gender. He was a tireless advocate of civil liberties and the rights of minorities, including gays, lesbians, and transgendered persons.

The author or editor of over fifty books, including Sexual Attitudes: Myths and Realities, with Bonnie Bullough, and hundreds of articles, he was renowned in several areas of human interest, including history, sexology, nursing, and liberal religion. Bullough was a Distinguished Professor Emeritus at the University at Buffalo, an Outstanding Professor Emeritus at California State University, a past president of the Society for the Scientific Study of Sex, a former dean of the Faculty of Natural and Social Sciences at Dean at Buffalo State College, and one of the founders of the American Association for the History of Nursing. His SKEPTICAL INQUIRER articles included "Therapeutic Touch: Why Do Nurses Believe?" (with Bonnie Bullough, Winter 1993) and "Spirit Rapping Unmasked: An 1851 Investigation and Its Aftermath" (Fall 1985).

Bullough served on the Board of Directors of the Center for Inquiry since its inception and was personally involved in its outreach. He accompanied the CFI Explorers Club on a cruise to Alaska in early June and presented a paper on board. An article based on those remarks will be published in Free Inquiry magazine.

Bullough was one of the leading secular humanists in North America and the world and was a liberal voice for the right of self-determination, tolerance, and dignity. He leaves his current wife, Gwen Brewer (Professor Emeritus, University of California), and four children.

—Paul Kurtz



## *Parade*'s Rosenfeld Reprises Dubious Acupuncture Claim

In a July/August 1999 News and Comment item, "Questioning Dr. Isadore Rosenfeld's China Acupuncture Story," I detailed the efforts of myself and Dr. Wallace Sampson to make sense of a fantastic claim contained in the August 16, 1998, issue of Parade magazine. In that Parade article, Rosenfeld presented a photograph that he had taken years earlier in China during "open-heart surgery" on a young female patient who remained "wide awake and smiling" as "the surgeon proceeded to open her chest. Her only 'anesthetic' was an acupuncture needle in her right earlobe that was connected to an electrical source. She never flinched. There was no mask on her face."

Even more improbable than the pain factor was Rosenfeld's photographic confirmation of the absence of an endotracheal tube for artificial ventilation, which would be required to keep the lungs from collapsing if the surgeon had indeed opened the chest. Had Rosenfeld, a cardiologist but not a cardiothoracic surgeon, perhaps been mistaken about the open chest? No, indeed. According to his 1996 book, Dr. Rosenfeld's Guide to Alternative Medicine (pages 30–32): "The surgeon . . . cut through the . . . breastbone with an electric buzzsaw [and the woman's] chest was split in two [and] spread apart with a large clamp to expose the heart."

Rosenfeld has reprised his seemingly impossible claim in his July 9, 2006, Parade column, "Does Acupuncture Really Work?," though in less detail and without the telltale photo: "In 1978, I was invited to China to witness an open-heart procedure. . . . She remained wide awake and smiling throughout the operation even though the only anesthesia administered was an acupuncture needle placed in her ear."

This second column is particularly dismaying given my correspondence with Rosenfeld (in the aftermath of his first) during which I conveyed my above concerns and more, including the fact that his photo shows the woman's "heart" situated too far left to be within her chest cavity. Rather than addressing my comments, Rosenfeld instead referred Dr. Sampson and me to famed cardiac surgeon Michael DeBakey, whom he said would put to rest our "legitimate technical questions about ventilator support." Instead, DeBakey confirmed that the operative approach described by Rosenfeld would likely cause the patient's lungs to collapse.

Although Dr. Rosenfeld continued to insist to us that he had not been the victim of a political-propaganda hoax, I had hoped that within his own heart he might have begun to allow the truth to trickle in. Apparently not.

—Gary Posner

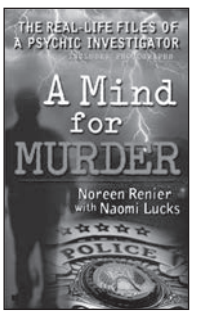
Gary Posner, M.D., is founder of Tampa Bay Skeptics and a CSICOP scientific consultant. The relevant portion of the 1998 Parade article may be seen at http://members.aol.com/garypos2/Rosenfeld_photo1.html.

Following the success of Court TV's "documentary" series Psychic Detectives, the network has launched a new program titled Haunting Evidence. "Some clues are found. Others are sensed," claims the reality television series, in which California psychic Carla Baron and two other investigators spend twenty-four hours revisiting real-life cold case murders in the expectation that their powers will succeed where police have failed.

Baron (touted as a "psychic profiler") is joined by New Age bookstore owner (and "highly-esteemed medium") John J. Oliver and a "respected paranormal researcher" named Patrick Burns. None of the three appear to have good track record of solving crimes. In fact, Baron was investigated by the Center for Inquiry/West's Independent Investigations Group, which meticulously documented her long list of unqualified failures as well as her rare (and heavily qualified) successes. (See page 5 of this issue and "Carla Baron Psychic Detective Update" in the March/April 2006 SI.)

Of course, the fact that psychic detectives have a spectacular track record of failure has not stopped them from making claims to the contrary in their media appearances. Oddly, the team doesn't tackle obvious missing persons cases that many Americans are desperate to solve, such as the 1996 murder of JonBenet Ramsey, or Natalee Holloway's 2005 disappearance. Perhaps those cases are too high-profile, and might cause the public to wonder why America's top psychic detectives hadn't solved those long ago.

In a recent episode, the group went to Athens, Georgia, to look into the unsolved 2001 murder of college student Tara Baker. The investigators visit the Baker family, camera crew in tow, and ask them to relive the daughter's death. Much of Haunting Evidence is unseemly and voyeuristic, for example when the investigators launch into very graphic, detailed descriptions of how they think Baker was murdered (based entirely on "feelings," guesses, and conjecture). They later head to Baker's grave, though it's unclear why—other than for dramatic effect. Ghost hunters usually claim that people's ghosts remain not at the spot they were buried, but where they died (hence haunted houses, not haunted cemeteries). Apparently the group was unaware of this, but in the end it didn't matter, since the visit was unproductive.




## Skeptic's Lawsuit Stalls 'Psychic' Renier's Book

"Psychic detective" Noreen Renier's memoir, A Mind for Murder, has been pulled by the publisher in response to a skeptic's lawsuit. John Merrell's court filings accuse Renier, whose book devotes two chapters to her legal battles with Merrell, of violating a 1992 settlement agreement between the two of them that mandated an end to all mutual actions that "diminish and/or disparage the other's reputation . . . including . . . contacts with . . . media of any type." Rumor has it that a revised edition of the book will be launched before year's end.

—Gary Posner

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# New Future Fund

## This phase of the campaign spotlights a family of high-impact projects.

As construction of the Center for Inquiry–Transnational expansion is completed, we turn to new challenge goals in our multi-year, $26.26 million New Future Fund campaign.

The New Future Fund is an ambitious campaign to support the Center for Inquiry, the Committee for the Scientific Investigation of Claims of the Paranormal, and the Council for Secular Humanism through endowment funding and support for expanded programming. The New Future Fund was launched after thorough study, and its goals reflect needs judged indispensable if the Center for Inquiry is to continue serving society as the leading champion of reason, scientific naturalism, and humanist values.

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Intelligent design (ID) theory is creationism's new face, sparking some 70 new controversies in an astonishing 26 states. CSICOP is gearing up to fight back with grassroots outreach to mobilize skeptics at the local level when ID proposals loom; a stimulating new Web site, www.csicop.org/creationwatch; and media outreach, from new literature to books to top-shelf online columnists.

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The Center for Inquiry presses for humanism, science, and reason worldwide. Centers for Inquiry have been established in Argentina, China, Egypt, France, Germany, India, Nepal, Nigeria, Peru, Russia, and elsewhere, pursuing regionally tailored agendas.

The Center and its affiliates have facilitated international meetings of humanists and skeptics for more than two decades. Your gift to the New Future Fund will help this transnational expansion continue.

## Outreach

The Center for Inquiry movement began with publishing, still essential to our mission. Skeptical Inquirer and Free Inquiry headline a family of magazines in three languages, newsletters, and Web sites. Professional public education and media relations further amplify our message. Campus outreach presents our message of science and reason to the leaders of tomorrow.

Your gift to the New Future Fund can help to support core publishing outreach (this issue of Skeptical Inquirer is four pages longer than early-2005 issues, thanks to support from the New Future Fund), fuel our exploitation of new communications technologies, and fund more aggressive on-campus programs. The New Future Fund is key to the future promotion of skepticism, science, reason, and humanism by the Center for Inquiry and its affiliates.

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Oliver, the medium, states confidently not only that the police already have the DNA evidence they need to find Baker's murderer, but that he will be caught. (Which makes one wonder why the group was needed in the first place.) The investigators claim that Baker knew her killer well, and also that they communicated with Baker's ghost. If Baker knew her killer well, she would presumably know his name, address, and telephone number; this is exactly the sort of information that would be useful to police. Oddly, Baron's and Oliver's powers dim on that subject, and instead they provide only the usual ambiguous information that may (or may not) turn out to be true if and when the killer is found through real police work. At the end of the show, the team's haunting evidence—including a composite sketch of the supposed murderer—was turned over to the Athens police.

If the trio truly were trying to solve the case (instead of simply make entertaining television), it seems odd that they would limit themselves to only twenty-four hours of "investigation" and supposedly request that they not be given information about the case. Real detectives want as much information as possible, but on Haunting Evidence this technique is meant to impress the viewers when the team "senses" information about the murder that would have been obvious or appeared in news coverage. The information they come up with might seem inexplicable—unless, of course, they had spent a few minutes looking into the case before they showed up. If the psychics weren't sure where to look, they could have consulted a memorial Web site for the victim, www.TaraBaker.com, which includes dozens of newspaper stories detailing the crime.

In a way, Haunting Evidence will be a good test case. If the team truly can come up with new evidence (based on psychic powers) that actually brings a criminal to justice, it would be the first in history, and revolutionize the criminal justice system. If psychics can provide valid, reliable evidence that leads police to bodies and suspects, they should be in every police department. The show may in fact end up helping solve the crimes they feature—not through psychic powers but simply raising the crime's profile and encouraging the public to come forward to help the stalled investigation. At the end of the series, SKEPTICAL INQUIRER will survey the show's results and list the murderers that Baron, Oliver, and Burns brought to justice.

Haunting Evidence is a revealing portrayal of how psychic detectives often operate: They show up, survey the crime scene with their "special senses," making confident statements about the crime that the police either already know or can't verify, or that are simply wrong. They reassure grieving families that their murdered or missing loved ones were caring, wonderful people who are now at peace. The team concludes by giving their information to police and acting as if they have helped solve the crime, when nothing of the sort happened. The murderer is not caught and the crime remains unsolved. The only "success" was in producing another television show lending credibility to psychics who have once again clearly and demonstrably failed to give useful information.

Court TV's slogan, which appears in ads for Haunting Evidence, is "Seriously Entertaining." Yet the families of those murdered are desperate to find justice, not provide entertainment for CourtTV's audience. This highlights one of the real tragedies of the psychic detective business: they prey on the vulnerable and only pretend to provide answers.

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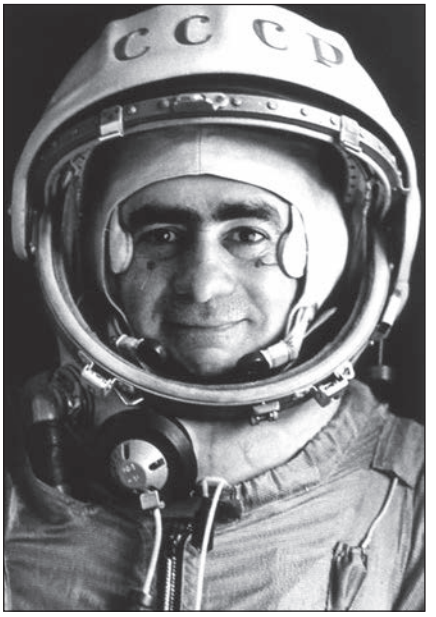
CSICOP

The story of Soviet cosmonaut Ivan Istochnikov is an amazing one. He piloted Soyuz 2, disappeared in space in 1968, and faded from history. He was removed from the photos in which he appeared with other cosmonauts in front of the Kremlin and nobody knew anything about him until an American journalist, Mike Arena, bought unclassified documents from the USSR at Sotheby's in New York City in 1993. Arena found photographs and other papers related to Istochnikov's odyssey. "The question is why [he was deleted from history], what he had done, why he annoyed [the Soviet government]," asked journalist Iker Jiménez on the program Cuarto milenio, on the Spanish TV channel Cuatro, on June 11, 2006.

Jiménez is one of the most famous Spanish writers on pseudoscientific topics. He presented the story of Istochnikov on his show as a true fact that his team had revealed in its investigation. One of Jiménez's collaborators, Gerardo Peláez, said the Soviet authorities made Istochnikov disappear because he was the personification of "a noisy failure." Jiménez devoted several minutes of his show to the cosmonaut as a tribute, and some hours later, an artist was laughing about it. "It's all very funny!" Spanish photographer Joan Fontcuberta said to me. In his work, he has played for years "with the equivocal and the ambiguous"; in 1997, he created an exhibition, called "Sputnik," on a nonexistent cosmonaut. He fabricated press clippings, photographs, space paraphernalia, videos, and the story told on Cuarto milenio by Iker Jiménez. Everything seemed real, but everything was untrue. The name of the cosmonaut, Ivan Istochnikov, is a translation of the name of the artist, and the face of the Soviet space explorer is the face of




the photographer.

A week after the TV show aired, Jiménez devoted only one minute to the correction and told his audience that the story of Istochnikov was a "cosmic urban legend" and that Fontcuberta is a controversial photographer. Everybody in Spain knows about the work of Fontcuberta, who in 1998 received the National Award for Photography in Spain, and has devoted his latest exhibition to the supposed finding of mermaid fossils. If the paranormal investigators had done a Google search for "Istochnikov" they would have found that the first references talk about the case of the cosmonaut as a joke perpetrated by an artist.

Nostradamus was resurrected in the French press a few days after Istochnikov's appearance in Spain. On June 21, 2006, Le Parisien published a strange quatrain written by the French seer: "When 2006 is six months over the King of Spain crosses the Pyrenees with his army. Beelzebub's legions await battle in the plains of Central Europe. Destruction and defeat fall upon the evil ones. The Holy Grail returns with the triumphant King to Hispania." Nostradamus, the newspaper said, predicted the victory of the Spanish team in soccer's World Cup in Germany. The story was published in many media in Spain, where I read it in Spain's most important newspaper, El país, distributed in Latin America and Europe.

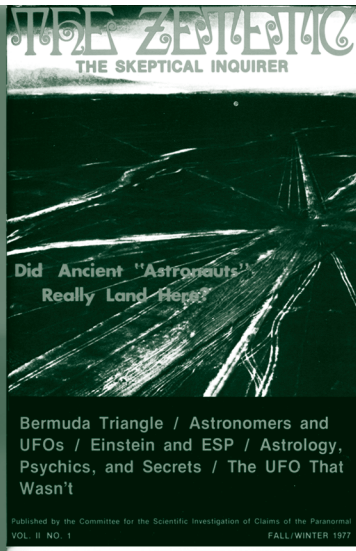
The truth is that this prophecy, like one that supposedly predicted the September 11, 2001, attacks, was a recent creation. A soccer fan invented the quatrain last November 13 in an Internet newsgroup after Spain qualified for the World Cup. "Nostradamus is talking about the trip to Germany that the King of Spain will make to see his 'army' (national team) play in the W.C. Beelzebub's legions are obviously the foreign national teams that will be defeated in Central Europe (Germany). The 'Holy Grail' (obviously the World Cup) is carried by the King back to Spain. Is this amazing or what?" he wrote, confessing the hoax hours later. "I never expected that my quatrain would be published by the media as an actual one," the author told me. Everybody could check online in two minutes to see if this quatrain exists in the writings of Nostradamus, but many journalists preferred to publish it without doing that, just as the team of paranormal investigators from Cuarto milenio did in the case of the imaginary soviet cosmonaut.

—Luis Alfonso Gámez

Luis Alfonso Gámez is a skeptic and journalist in Spain.

# Summing Up Thirty Years of the SKEPTICAL INQUIRER

**PAUL KURTZ**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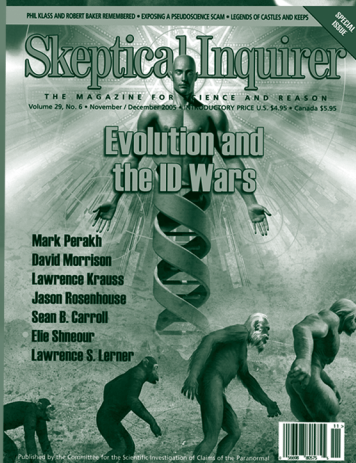
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his issue of the SKEPTICAL INQUIRER marks the thirtieth year of publication of the official magazine of the Committee for the Scientific Investigation of Claims of the Paranormal—which had been founded six months before the first issue was published in Fall/Winter 1976 as The Zetetic (meaning "skeptical seeker"), under the editorship of Marcello Truzzi. The name was changed to the SKEPTICAL INQUIRER the following year, and Kendrick Frazier was appointed the new editor, a position he has served with brilliant virtuosity and distinction ever since. Ken had been the editor of Science News, and during his tenure at the SKEPTICAL INQUIRER he also worked full time at Sandia National Laboratories for 23 years until his retirement from there this past April. He has kept abreast of the many breakthroughs on the frontiers of the sciences and is eminently qualified to interpret the sciences for the general public; hence he continues to be a perfect fit for the SKEPTICAL INQUIRER.

In preparation for this overview, I reviewed the entire corpus published in the past thirty years, which will soon be available on CD-ROM. What impressed me greatly was the wide range of topics and the distinguished authors that Ken has attracted to its pages. I can highlight only some of these in this article. I wish to use this occasion to focus on what I believe we have accomplished in the past three decades and to speculate as to what directions our magazine might take in future decades. Today, many threats to science come from disparate quarters—as Ken points out in his editorial, "In Defense of the Higher Values," in the July/August 2006 issue of the SKEPTICAL INQUIRER. These include efforts to undermine the integrity of science and freedom of research, and we are continually confronted by irrational anti-scientific forces rooted in fundamentalist religion and ideology. Given these challenges, no doubt skeptical inquiry will continue to be necessary in the future.

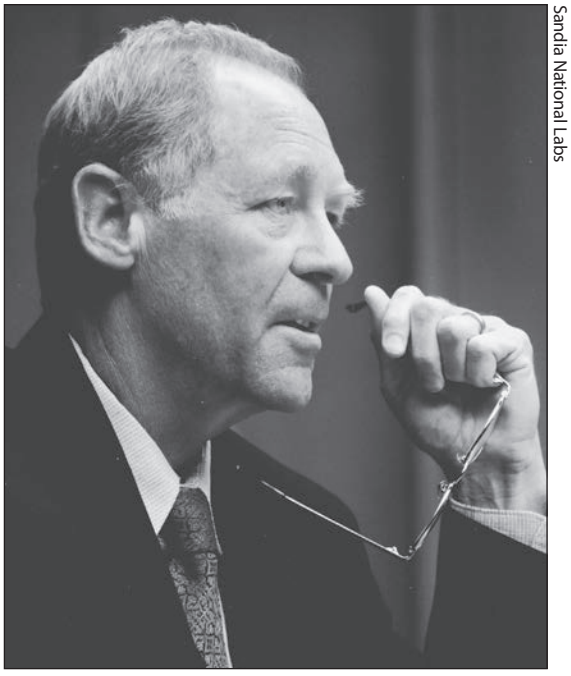
The original name of CSICOP was the Committee for the Scientific Investigation of Claims of the Paranormal and Other Phenomena, but this mouthful was deemed too long—and the acronym would have been CSICOPOP—so we shortened it! It is clear that the SKEPTICAL INQUIRER was never intended to confine itself solely to paranormal issues; and the topics it has dealt with have been truly wide-ranging. The subtitle that was eventually developed and now appears on every issue is "The Magazine for Science and Reason," which states succinctly

Paul Kurtz is Professor Emeritus of Philosophy at the State University of New York at Buffalo and Chairman of the Center for Inquiry/Transnational and CSICOP.

what it is all about. It has encouraged "the critical investigation of paranormal and fringe-science claims," but "it also promotes science and scientific inquiry, critical thinking, science education, and the use of reason."

## I.

The enduring contribution of the SKEPTICAL INQUIRER in its first three decades, I submit, has been its persistent efforts to raise the level of the public understanding of science. No nation or region can cope with the challenges of the global marketplace and compete effectively unless it provides a steady stream of highly educated scientific practitioners. This is true of the developing world, which wishes to catch up with the advanced industrial and informational economies; but it is true of those latter nations as well. Today, China and India have embarked upon massive efforts to increase the number of scientists in their countries—China graduates anywhere from 350,000 to 600,000 engineers annually, compared to 70,000 to 120,000 in the United States, of which some 30,000 are foreign born. Alas, we still have a tremendous task, for U.S. students rank only twenty-fourth in scientific knowledge out of the twenty-nine industrialized countries. Only 40 percent of twelfth graders tested had any comprehension of the basic concepts and methods of science. Presumably, even fewer political figures in Washington have the requisite comprehension!



Sandia National Labs

Kendrick Frazier

The long-standing policy of CSICOP has been four-fold: (1) to criticize claims of the paranormal and pseudoscience, (2) to explicate the methods of scientific inquiry and the nature of the scientific outlook, (3) to seek a balanced view of science in the mass media, and (4) to teach critical thinking in the schools. Unfortunately, the constant attacks on science, the rejection of evolution by creationists and intelligent design advocates (some thirty-seven states have proposed programs to teach ID and creationism in the schools), the limiting of stem-cell research by the federal government, and the refusal to accept scientific findings about global warming vividly demonstrate the uphill battle that the United States faces unless it improves the public appreciation of scientific research.

Clearly, the major focus of the SKEPTICAL INQUIRER, especially in its first two decades, was on the paranormal; for there was tremendous public fascination with this area of human interest, which was heavily promoted and sensationalized by an often irresponsible media. Our interest was not simply in the paranormal curiosity shop but to increase an understanding among the general public of how science works.

The term paranormal referred to phenomena that allegedly went "beyond normal science." Many topics were lumped under this rubric. And many credulous people believed that there was a paranormal-spiritual dimension that leaked into our universe and caused strange entities and events. Included in this mysterious realm was a wide range of phenomena, which the SKEPTICAL INQUIRER examined within its pages over the years: psychic claims and predictions; parapsychology (psi, ESP, clairvoyance, telepathy, precognition, psychokinesis); UFO visitations and abductions by extraterrestrials (Roswell, cattle mutilations, crop circles); monsters of the deep (the Loch Ness monster) and of the forests and mountains (Sasquatch, or Bigfoot); mysteries of the oceans (the Bermuda Triangle, Atlantis); cryptozoology (the search for unknown species); ghosts, apparitions and haunted houses (The Amityville Horror); astrology and horoscopes (Jeanne Dixon, the "Mars effect," the "Jupiter effect"), spoon bending (Uri Geller); remote viewing (Targ and Puthoff); cult anthropology; von Däniken and the Nazca plains of Peru; biorhythms; spontaneous human combustion; psychic surgery and faith healing; the full moon and moon madness; firewalking; psychic detectives; Ganzfeld experiments; poltergeists; near-death and out-of-body experiences; reincarnation; Immanuel Velikovsky and catastrophes in the past; doomsday forecasts; and much, much more!

The term paranormal was first used by parapsychologists, but it was stretched uncritically by advocates of the New Age, the Age of Aquarius, and harmonic convergence to include bizarre phenomena largely unexamined by mainline science. Murray Gell-Mann, Nobel Laureate and Fellow of CSICOP, at our conference at the University of Colorado in 1986—I can remember it vividly—observed that we skeptics do not really believe in the "paranormal," because it deals with things beyond science, and as skeptical inquirers, he reiterated that we were dealing with investigations amenable to scientific methods of explanation. We would refuse to stop at any point and attribute phenomena to occult or hidden causes; we would keep looking for causal explanations and never declare that they were beyond the realm of natural causation by invoking the paranormal; and if we found new explanations, we would extend science to incorporate them. Incidentally, he also denied the feeling of some New Agers "that quantum mechanics is so weird, that anything goes" (SKEPTICAL INQUIRER, Fall 1986).

Sociologist Marcello Truzzi, who studied satanic cults, pointed out in our very first issue that we intended to examine esoteric anomalous claims, the "damned facts," as Charles Fort

called them (hail in July, a rainfall of frogs, etc.), to see what we could make of them. The public was intrigued by such mysteries, and we tried to encourage scientific investigators to explain them and to find out if they ever even existed or occurred.

Almost every issue of the SKEPTICAL INQUIRER attempted to fathom what was really happening in one or another alleged paranormal area. Thus, Ray Hyman described the technique of "cold reading" to show how guesswork and cues were used by psychics to deceive people who thought that they were having a bona fide paranormal reading. Philip Klass, head of CSICOP's UFO subcommittee, tried to unravel unusual cases of alleged UFO visitations and abductions in answer to astronomer J. Allen Hynek or Bruce Maccabee or other UFO buffs, and offered alternative prosaic explanations to account for apparent misperceptions. Conjuror James Randi and Scientific American columnist Martin Gardner looked for fraud or deceit. This was graphically illustrated in the case of a young psychic named Suzie Cottrell, who had bamboozled Johnny Carson by card reading. Put to the test under controlled conditions, Gardner said that she used Matt Schulein's forced-card trick, and Randi caught her red-handed peeking at the bottom card (see the Spring 1979 issue).

The SKEPTICAL INQUIRER published what appeared to be solutions to previously unexplained mysteries. We became exasperated with the media—such as NBC's Unsolved Mysteries, because they would present persons as having "real" paranormal abilities in spite of the fact that those persons were fraudulent—as in the case of Tina Resch, the Columbus, Ohio, youngster. Poltergeists supposedly manifested themselves when she came on the scene, lamps shattered, lights or faucets turned off and on. She was exposed by a TV camera that the crew left on while she thought that she was alone in a room: she was seen knocking down a lamp herself and screaming "poltergeist!"

I must say that these early years were exciting and exhilarating. We loved working with James Randi, Penn and Teller, Jamy Ian Swiss, Henry Gordon, Bob Steiner, and other magicians, who could usually duplicate a supposedly paranormal feat by sleight of hand or other forms of chicanery.

Deception is unfortunately widespread in human history, and it is revealing to point it out when it is encountered, especially where loose protocol makes it easy to hoodwink a gullible experimenter. Harry Houdini performed yeoman's service earlier in the twentieth century by exposing the blatant fraud perpetuated by Marjery Crandon and other spiritualists and mediums. I surely do not wish to suggest that conscious deception is the primary explanation for all or even most paranormal beliefs. Rather, it is self-deception that accounts for so much credulity. There is a powerful willingness in all too many people to believe in the unbelievable in spite of a lack of evidence or even evidence to the contrary. This propensity was due in part to what I have called the transcendental temptation, the tendency to resort to magical thinking, the attribution of occult causes for natural phenomena. The best antidote for this, I submit, is critical thinking and the search for natural causes of such phenomena.

Some paranormalists complained that we were poking fun at them and that ridicule is no substitute for objective inquiry. Martin Gardner observed that one joke might be worth a thousand syllogisms, if it dethrones a phony or nincompoop. Editor Kendrick Frazier, in my judgment, has always attempted to be fair-minded; and if an article criticized a proponent of a paranormal claim, he would invariably give that person an opportunity to respond. We attempted to make it clear that we were interested in fair and impartial inquiry, that we were not dogmatic or closed-minded, and that skepticism did not imply a priori rejection of any reasonable claim. Indeed, I insisted that our skepticism was not totalistic or nihilistic about paranormal claims, but that we proposed to examine a claim by means of scientific inquiry. I called this "the new skepticism" (see the SKEPTICAL INQUIRER Winter 1994), to distance it from classical Greco-Roman skepticism, which rejected virtually anything and everything; for no kind of knowledge was considered reliable. But this was before the emergence of modern science, in which hypotheses and theories are based upon rigorous methods of empirical investigation, experimental confirmation, and replication, and also by whether a paranormal claim contradicts the body of tested theories or is consistent with them. One must be prepared to overthrow an entire theoretical framework—and this has happened often in the history of science—but there has to be strong contravailing evidence that requires it. It is clear that skeptical doubt is an integral part of the method of science, and scientists should be prepared to question received scientific doctrines and reject them in the light of new evidence.

## II.

Looking back to the early years of the SKEPTICAL INQUIRER and CSICOP, it is evident that the salient achievement was that we called for new investigations and researchers in our network of collaborators responded by engaging in them.

(1) A good illustration of this is the determined efforts by skeptics to evaluate astrology experimentally. Although not paranormal in a strict sense—it was surely on the fringe of science—nevertheless, the claim that there were astro-biological influences present at the moment of birth could be tested. The "Mars effect" was a good illustration of this. French psychologists Michel and Francois Gauquelin maintained that the positions of planets at the time and place of birth—in this case Mars (in the first and fourth sector of the heavens)—was correlated with whether or not a person would become a sports champion. Egged on by Truzzi and a British psychologist, Hans Eysenck, we attempted several tests of this claim, and scientists tested the birth dates of sports champions born in the United States and France (and similar tests were made for other planets and professions). The results were negative, but it took twenty years of patient investigation to ascertain that. The most likely explanation for the "Mars effect" is biased data selection by the Gauquelins. CSICOP encouraged other researchers (such as Shawn Carlson and Geoffrey Dean) to test classical astrological claims. The results, published in the pages of the SKEPTICAL INQUIRER, again were invariably negative. Astrology provided no coherent theory or mechanism for the influence of planetary bodies at the time and place of a person's birth.

(2) Similar efforts were applied to parapsychology. Ray Hyman, James Alcock, Barry Beyerstein, and others were able by serious meta-analyses to evaluate the results of experimental

research. Working with Charles Honorton, Robert Morris, and other parapsychologists, they questioned the findings of parapsychological investigations, and they found badly designed protocols, data leakage, experimenter biases, and insufficient replication by independent researchers.

The significant achievement of the SKEPTICAL INQUIRER was that it helped crystallize an appreciation by the scientific community of the need to investigate such claims. After the establishment of CSICOP, many scientific researchers were willing to devote the time to carefully examine the data. These results were published in the SKEPTICAL INQUIRER, so there was an independent record of explanation. And anyone who was puzzled by the phenomena could consult this new literature to deflate the paranormal balloon. This applied to a wide range of other phenomena.

(3) Near-death experiences provided insufficient evidence for the conjecture that a conscious self or soul left the body and viewed it from afar—this is better explained by reference to physiological and psychological causes, as Susan Blackmore pointed out in the SKEPTICAL INQUIRER (Fall 1991).

(4) The ability of fire-walking gurus to walk over hot coals was not due to some mind-over-matter spiritual power but rather because hot embers are poor conductors of heat, and it was possible for anyone to attempt it without injury.

(5) Another area of importance was the critical evaluation of the use of hypnosis by UFO investigators, who believed they were uncovering repressed memories that depicted alleged abductions. John Mack, a professor of psychiatry at Harvard, used hypnosis to probe the unconscious minds of certain troubled people who thought they had been abducted aboard UFOs by extraterrestrials. There was a similar pattern in such cases, he said, which was repeated time and time again by his patients: a sense of lost time, flashing lights, out-of-body experiences, etc. Mack thought this provided strong evidence for the claim; skeptics maintained that these evidences were not corroborated by independent testimony. At one point, Carl Sagan wrote to us, urging CSICOP to undertake an investigation of these claims, which by then were proliferating everywhere. We invited John Mack to a CSICOP conference in Seattle in June 1994 to hear what he had to say. There was a colorful confrontation between John Mack the believer and Phil Klass the skeptic—who insisted that hypnosis was unreliable as a source of truth. The influence of urban abduction legends popularized by the mass media predisposed many fantasy-prone persons to imbibe this tale, and the suggestibility of hypnotists reinforced the reality of their subjective experiences. Some critics asked Mack whether he accepted the fantasies of his psychotic patients as true—which gave him some pause.

"The Amazing" Kreskin, who used hypnosis in his act, appeared at one of CSICOP's conferences expressing doubt that hypnosis was a genuine "trance state" or a source of truth—it seemed to work in suggestible patients because they followed the bidding of the hypnotist. (Incidentally, many skeptics were highly critical of Kreskin for suggesting that he possessed ESP.)

(6) Hypnosis was also used in so-called past-life regressions to provide supposed evidence of previous lives. The SKEPTICAL INQUIRER carried many articles criticizing this technique. Past life therapists maintained that the hypnotic state provided empirical support for the doctrine of reincarnation, maintaining that the memory of a previous life was lodged deep within the unconscious. More parsimonious explanations of these experiences are available: creative imagination, suggestions implanted by the hypnotherapist, and cryptomnesia (information stored in the unconscious memory without knowledge of the true source). Again, there was no independent factual corroboration, and these methods seem to rely more on a priori belief in reincarnation than reliable empirical evidence.

(7) Many research issues in psychology were critically examined in the SKEPTICAL INQUIRER. The work of Elizabeth Loftus is especially noteworthy here. In the decade of the 1990s, the mass media focused on charges that young children had been molested by relatives, friends, and teachers. Many reputations were destroyed after lurid accounts of sexual improprieties were made public. The popularity of such confessions spread like wildfire, and thousands of people claimed that they had been likewise molested. This was dramatized by the McMartin trial in California, where teachers in a day-care center were accused of sexual assaults of young children. This was based on testimony extracted from children and extrapolated by overzealous prosecutors. It had been pointed out that there is a "false-memory syndrome," which is fed by suggestion, and that testimony based on this is highly questionable. The SKEPTICAL INQUIRER was among the first publications to point out the fragmentary nature of the evidence and the unreliability of such testimony. This helped to turn the tide against such accusations, many of which had been exaggerated.

It would be useful at this point to sum up the pitfalls that skeptical inquirers encountered in studying paranormal and fringe-science claims and of guidelines that emerged as a consequence:

- Eyewitness subjective testimony uncritically accepted without corroboration is a potential source of deception (in accounts of molestation, reports of apparitions, past-life regression, UFO visitations, etc.).
- Extraordinary claims demand extraordinary evidence.
- The burden of proof rests with the claimant, not the investigators.
- Paranormal reports are like unsinkable rubber ducks: no matter how many times they are submerged, they tend to surface again.
- There is widespread gullibility and will to believe expressed by certain segments of the population, fascinated by mystery and magical thinking and willingness to accept tales of the occult or supernatural.
- In some cases, but surely not all, blatant fraud and chicanery may be observed, even in young children.
- In evaluating evidence, watch out for hidden bias and self-deception pro and con (including your own) to determine if something is a pseudoscience or not.
- There is no easily drawn demarcation line between science and pseudoscience, for one may be dealing with a proto-science. In my view, we need to descend to the concrete data and we cannot always judge a priori on purely philosophical grounds whether something is a pseudoscience or not (although I agree in general with Mario Bunge's views about the characteristics of a pseudosci-

ence; see SKEPTICAL INQUIRER, Fall 1984 and July/August 2006).

## III.

In recent years, popular interest in the paranormal has declined markedly, at least in comparison with its heyday. I do not deny that belief in paranormal phenomena is widespread; however, there are fewer manifestations of it in the mass media, and apparently less scientific interest. In previous decades, there were huge best sellers whose sales figures numbered in the millions: Raymond Moody's Life After Life, Charles Berlitz's The Bermuda Triangle, Erich von Däniken's Chariot of the Gods, etc.

Today, very few such books make The New York Times best-sellers list; and a top-selling paranormal book is likely to sell only 200,000 to 300,000 copies. (Sylvia Browne is the current best-selling guru, but there are few others besides her.) And there are very few major television programs devoted to the paranormal, though there are smaller-market cable shows.

Attention has turned to other areas. First, alternative medicine has grown by leaps and bounds. Prior to 1996, very few medical schools taught courses or offered programs in alternative medicine—and the medical profession was highly skeptical of the therapeutic value of remedies such as homeopathy, acupuncture, Therapeutic Touch, herbal medicines, iridology, and chiropractic. This magazine published many articles critical of these areas. It may be that such therapies are useful—the criterion we suggested was to conduct random, double-blind tests of their efficacy. Until there is sufficient data to support a therapy, the public should be cautious of its use. The medical profession needs to be open-minded yet suspicious of therapies until they are demonstrated to work—notwithstanding the evidential value of placebos.

Interestingly, the skeptical movement in Europe has concentrated on alternative medicines, though this is not strictly paranormal but is on the borderline of fringe medicine. I must confess that we are dismayed by the rapid growth of alternative and complementary medicine, which has had enormous acceptance virtually overnight. This is helped no doubt by the fact that it is a highly profitable source of income for both practitioners and the companies that market herbal remedies. Homeopathy is very strong in Europe and is now making inroads in the United States, though its remedies have never been adequately tested. Therapeutic Touch is so widespread in the nursing profession that it has gained great acceptance, though the basis of its curative powers has not been adequately demonstrated. The role of intercessory prayer as a healing method has provoked considerable controversy. Some advocates of prayer have claimed positive results; however, skeptics have seriously questioned the methodology of these tests. The most systematic tests were recently conducted by a team of scientists led by Herbert Benson (see the July/August 2006 SKEPTICAL INQUIRER). Using fairly rigorous protocol, these tests produced negative results.

Many skeptics have likewise been very critical of schools of psychotherapy, notably psychoanalysis, for lacking clinical data about the efficacy of their methods. In this regard, the Center for Inquiry has taken over the journal The Scientific Review of Mental Health Practice edited by Scott Lilienfeld, which evaluates the scientific validity of mental-health treatment modalities. Some people say that the change from evidence-based medicine to other forms of medicine spells the emergence of a new paradigm; Marcia Angel has observed that this shift is toward a kind of spiritual medicine, influenced by the growth of religiosity in the culture.

Over the years, the SKEPTICAL INQUIRER has dealt with many other areas that needed critical scrutiny, including the efficacy of dowsing, graphology, facilitated communication, SETI, animal speech, the Atkins Diet, obesity, the Rorschach test, holistic medicine, and veterinary medicine. In addition, there were many articles on the philosophy of science, the nature of consciousness, and the evidence for evolution.

## IV.

Numerous distinguished scientists have contributed to SKEPTICAL INQUIRER, including Richard Feynman, Glenn Seaborg, Leon Lederman, Gerald Holton, Steve Weinberg, Carl Sagan, Richard Dawkins, Jill Tarter, Steven Pinker, Carol Tavris, Neil de Grasse Tyson, and Victor Stenger. Among the topics examined have been quantum mechanics, the brain and consciousness, and cold fusion. Thus, the scope of the SKEPTICAL INQUIRER under Kendrick Frazier's editorship has been impressively comprehensive. And I should add that his fine editorials in every issue have pinpointed central questions of concern to science.

In a very real sense, the most important controversy in the past decade has been the relationship between religion and the paranormal and whether and to what extent CSICOP and the SKEPTICAL INQUIRER should deal with religious claims. As a matter of fact, evangelical and fundamentalist religion have grown to such proportions that religion and the paranormal overlap and one cannot easily deal with one without the other. The SKEPTICAL INQUIRER has dealt with religious claims from the earliest. First, it was in the vanguard of responding to the attacks on the theory of evolution coming from the creationists. Eugenie Scott, who served on the CSICOP Executive Council for a period of time, has done great service in critically analyzing "creation science," and the SKEPTICAL INQUIRER was among the first magazines to do so, demonstrating that creationism is not a science, for it does not provide a testable theory. The young-earth view

maintains that Earth and the species on it are of recent origin, a view so preposterous that it is difficult to take it seriously. Most recently, intelligent design theory (which rejects the young-earth theory) claims that the complexity of biological systems is evidence for design. Numerous articles in the SKEPTICAL INQUIRER have pointed out that evolution is supported by overwhelming evidence drawn from many sciences. The existence of vestigial organs in many species, including the human species, is hardly evidence for design; for they have no discernible function. And the extinction of millions of species on the planet is perhaps evidence for unintelligent design.

Second, the SKEPTICAL INQUIRER was always willing to deal with religious questions, insofar as there are empirical claims that are amenable to scientific treatment. Thus, the Shroud of Turin has been readily investigated in the SKEPTICAL INQUIRER (see, for example, November/December 1999), presenting evidence (such as carbon-14 dating) that indicated that it was a thirteenth-century cloth on which an image had been contrived. Joe Nickell (CSICOP's Senior Research Fellow for the past decade) has said for years that the shroud is a forgery—as did the bishop of the area of France where it first turned up maintained. Moreover, Nickell has shown how such a shroud could easily have been concocted. Similarly, the so-called Bible Code was easily refuted by Dave Thomas (see the SKEPTICAL INQUIRER, November/December 1997 and March/April 1998).

In recent years, reports of miracles have proliferated, much to the surprise of rationalists, who deplore the apparent reversion of society to the thinking of the Middle Ages. David Hume offered powerful arguments questioning miracles, which he said were due to ignorance of the causes of such phenomena. There is abundant evidence, said Hume, to infer that nature exhibits regularities; hence, we should reject any exception to the laws of nature. In the late eighteenth century, showers of meteorites were interpreted by religious believers as signs of God's wrath. A special commission of scientists in France was appointed to investigate whether such reports of objects falling from the sky were authentic, and if so, if they were caused by natural events.

The SKEPTICAL INQUIRER has dealt with miracles in its pages, given the great public interest in them. The so-called miracle at Medjugorje, Yugoslavia, at a shrine where the Virgin Mary appeared before young children was critically discussed (November/December 2002). The conclusion was that the children's testimony has not been corroborated by independent testimony and was hence suspect. But as a result of the attention the children received, they became media celebrities. Oddly, the Virgin never warned about the terrible war that was about to engulf Bosnia and Kosovo. The cases were similar for the numerous other sightings of Mary and those of Jesus, which have attracted great public fascination. The investigations of Joe Nickell are models to follow; Nickell refuses to declare a priori that any miracle claim is false, but instead, he attempts where he can to conduct an on-site inquest into the facts surrounding the case. If, after investigation, he can show that the alleged miracle was due to misperception or deception, his analysis is far more effective.

The one area of interest in the paranormal that has also had a resurgence in recent years is "communicating with the dead." The form it has taken is reminiscent of the spiritualism of the nineteenth century, which had been thoroughly discredited because of fraud and deceit. The new wave of interest is fed by appearances on radio and television by such people as Sylvia Browne, James Van Praagh, and John Edwards. The techniques that the most popular psychics use are the crudest form of cold reading—which they seem to get away with easily. In some cases, they have resorted to doing hot readings (using information surreptitiously gleaned beforehand). This latter-day revival of spiritualism is no doubt fueled by the resurgence of religiosity in the United States, but it also shows a decline of respect for the rigorous standards of evidence used in the sciences.

The question of the relationship between science and religion intrigues many people today. It is especially encouraged by grants bestowed by the Templeton Foundation. Indeed, three special issues of the SKEPTICAL INQUIRER, beginning with July/August 1999 were devoted to explorations of the relationship or lack of it between these two perennial areas of human interest.

These issues of the SKEPTICAL INQUIRER proved to be the most popular that we have ever published. Most skeptics have taken a rather strong view that science and religion are two separate domains and that science needs latitude for freedom of research, without ecclesiastical or moral censorship. This is one of the most burning issues today. Stephen Jay Gould defended a dissenting viewpoint of two magisteria: religion, which included ethics within its domain, and science. The SKEPTICAL INQUIRER has consistently brought philosophers to its pages to discuss a range of philosophical questions on the borderlines of science, religion, and morality. Susan Haack, Mario Bunge, and myself, Paul Kurtz, among others, have argued that the scientific approach is relevant to ethics and therefore ethics should not be left to the exclusive domain of religion (see the September/October 2004 SKEPTICAL INQUIRER).

## V.

Skeptics have often felt isolated in a popular culture that is often impervious to or fails to fully appreciate the great discoveries of science on the frontiers of research. They have done arduous work attempting to convince producers, directors, and publishers to present the scientific outlook fairly. When pro-paranormal views are blithely expressed as true, we have urged that scientific critiques also be presented to provide some balance. Our goal is to inform the public about the scientific outlook. We believe that we still have a long way to go to achieve some measure of fairness in the media. Almost the first official act of CSICOP was to challenge NBC for its program Exploring the Unknown, narrated by Burt Lancaster, which presented pro-paranormal propaganda on topics such as psychic surgery and astrology, without any scientific dissent at all. Our suit against NBC citing the Fairness Doctrine was turned down by a federal judge, and our subsequent appeal to the First District Court in Washington was also rejected (see the Fall/Winter 1977

SKEPTICAL INQUIRER). Conversely, the SKEPTICAL INQUIRER has been the victim of many legal suits or threats of suits over the years. The most notorious was Uri Geller's protracted legal suits against James Randi, CSICOP, and Prometheus Books. The most recent suit has named Elizabeth Loftus and CSICOP for an article that she authored (with Melvin J. Guyer) on the case of alleged sexual abuse of "Jane Doe" in the SKEPTICAL INQUIRER (May/June 2002). So the struggle that we have waged still continues.

On a more positive note, it is a source of great satisfaction that the SKEPTICAL INQUIRER is read throughout the world and that CSICOP has helped generate new skeptics groups, magazines, and newsletters almost everywhere—from Australia and China to Argentina, Peru, Mexico, and Nigeria; from India, Eastern Europe, and Russia to Germany, France, Spain, Italy, and the United Kingdom, so that the Center for Inquiry/Transnational (including CSICOP) has become truly planetary in scope. Especially gratifying is the fact that CSICOP has convened meetings in places all over the world, including China, England, France, Russia, Australia, India, Germany, Africa, etc.

Looking ahead, I submit that the SKEPTICAL INQUIRER and CSICOP should investigate other kinds of intellectually challenging and controversial claims. It is difficult to know before- hand where the greatest needs will emerge. In my view, we cannot limit our agenda to the issues that were dominant thirty, twenty, or even ten years ago, interesting as they have been. I think that we should of course continue to investigate paranormal claims, given our skilled expertise in that area. But we need to widen our net by entering into new arenas we've never touched on before, and we should be ever-willing to apply the skeptical eye wherever it is needed. Actually, Editor Kendrick Frazier has already embarked in new directions, for recent issues of the SKEPTICAL INQUIRER have dealt with topics such as cyberterrorism, "A Skeptical Look at September 11," "The Luck Factor," and critical thinking about power plants and the waste of energy in our current distribution systems. But there are many other issues that we have not dealt with that would benefit from skeptical scrutiny—and these include issues in biogenetic engineering, religion, economics, ethics, and politics.

Perhaps we have already become the Committee for Scientific Investigation (CSI), to denote that we are moving in new directions. This fulfills our general commitment to science and reason that's stated in the masthead of the SKEPTICAL INQUIRER. But one may say, there are so many intellectually controversial issues at large in society, which do we select? May I suggest the following criteria: we should endeavor to enter into an area, first, if there is considerable public interest and controversy; second, where there has not been adequate scientific research nor rigorous peer review; third, where some kind of interdisciplinary cooperative efforts would be useful; and fourth, where we can enlist the help of specialists in a variety of fields who can apply their skills to help resolve the issues.

We originally criticized pseudoscientific, paranormal claims because we thought that they trivialized and distorted the meaning of genuine science. Many of the attacks on the integrity and independence of science today come from powerful political-theological-moral doctrines. For example, one of the key objections to stem-cell research is that researchers allegedly destroy innocent human life—even when they deal with the earliest stage of fetal development or when a cell begins to divide in a petri dish. First is the claim that the "soul" is implanted at the moment of conception and that human life begins at the first division of a cell, and second, that it is "immoral" for biogeneticists working in the laboratory to intervene. The first claim is surely an occult notion if there ever was one, and it urgently needs to be carefully evaluated by people working in the fields of biology, genetics, and medical ethics; a similar response can be made to the second claim that it is immoral to intervene. There are many other challenges that have emerged in the rapidly expanding field of biogenetic research that might benefit from careful scrutiny: among these are the ethics of organ transplants, the use of mind-enhancing drugs, life-extension technologies, etc. The "new singularity," says Ray Kurzweil, portends great opportunities for humankind but also perplexing moral issues that need examination.

## VI.

In closing, permit me to touch on another practical problem that looms larger every day for the SKEPTICAL INQUIRER and other serious magazines like it. I am here referring to a double whammy: the growth of the Internet on the one hand and the steady decline of reading of magazines on the other. No doubt, the Internet provides an unparalleled resource for everyone, but at the same time, it has eroded the financial base of the SKEPTICAL INQUIRER; and we do not see any easy solution to the deficit gap that increasingly imperils our survival.

Recognizing these dangers, we have extended our public outreach, first by offering for the first time an academic program "Science and the Public" at the graduate level. Second, we have just opened an Office of Public Policy at our new Center for Inquiry in Washington, D.C., the purpose of which is to defend the integrity of science in the nation's capital and to try to convince our political leaders of the vital importance of supporting science education and the public understanding of science.

Finally, the most gratifying factor in all of this has been the unfailing support of the readers of the SKEPTICAL INQUIRER, who have helped to sustain us throughout our first three

# Predator Panic: A Closer Look

BENJAMIN RADFORD

"Protect the children." Over the years that mantra has been applied to countless real and perceived threats. America has scrambled to protect its children from a wide variety of dangers including school shooters, cyberbullying, violent video games, snipers, Satanic Ritual Abuse, pornography, the Internet, and drugs.

Hundreds of millions of taxpayer dollars have been spent protecting children from one threat or other, often with little concern for how expensive or effective the remedies are—or how serious the threat actually is in the first place. So it is with America's latest panic: sexual predators.

According to lawmakers and near-daily news reports, sexual predators lurk everywhere: in parks, at schools, in the malls—even in children's bedrooms, through the Internet. A few rare (but high-profile) incidents have spawned an unprecedented deluge of new laws enacted in response to the public's fear. Every state has notification laws to alert communities about former sex offenders. Many states have banned sex offenders from living in certain areas, and are tracking them using satellite technology. Other states have gone even further; state emergency leaders in Florida and Texas, for example, are developing plans to route convicted sex offenders away from public emergency shelters during hurricanes. "We don't want them in the same shelters as others," said Texas Homeland Security Director Steve McCraw. (How exactly thousands of desperate and homeless storm victims are to be identified, screened, and routed in an emergency is unclear.)

Benjamin Radford wrote about Megan's Laws and lawmaking in response to moral panics in Media Mythmakers: How Journalists, Activists, and Advertisers Mislead Us.

## An Epidemic?

To many people, sex offenders pose a serious and growing threat—especially on the Internet. Attorney General Alberto Gonzales has made them a top priority this year, launching raids and arrest sweeps. According to Senate Majority Leader Bill Frist, "the danger to teens is high." On the April 18, 2005, CBS Evening News broadcast, correspondent Jim Acosta reported that "when a child is missing, chances are good it was a convicted sex offender." (Acosta is incorrect: If a child goes missing, a convicted sex offender is among the least likely explanations, far behind runaways, family abductions, and the child being lost or injured.) On his NBC series "To Catch a Predator," Dateline reporter Chris Hansen claimed that "the scope of the problem is immense," and "seems to be getting worse." Hansen claimed that Web predators are "a national epidemic," while Alberto Gonzales stated that there are 50,000 potential child predators online.

Sex offenders are clearly a real threat, and commit horrific crimes. Those who prey on children are dangerous, but how common are they? How great is the danger? After all, there are many dangers in the world—from lightning to Mad Cow Disease to school shootings—that are genuine but very remote. Let's examine some widely repeated claims about the threat posed by sex offenders.

## One in Five?

According to a May 3, 2006, ABC News report, "One in five children is now approached by online predators." This alarming statistic is commonly cited in news stories about prevalence of Internet predators, but the factoid is simply wrong. The "one in five statistic" can be traced back to a 2001 Department of Justice study issued by the National Center for Missing and Exploited Children ("The Youth Internet Safety Survey") that asked 1,501 American teens between 10 and 17 about their online experiences. Anyone bothering to actually read the report will find a very different picture. Among the study's conclusions: "Almost one in five (19 percent) . . . received an unwanted sexual solicitation in the past year." (A "sexual solicitation" is defined as a "request to engage in sexual activities or sexual talk or give personal sexual information that were unwanted or, whether wanted or not, made by an adult." Using this definition, one teen asking another teen if her or she is a virgin—or got lucky with a recent date—could be considered "sexual solicitation.") Not a single one of the reported solicitations led to any actual sexual contact or assault. Furthermore, almost half of the "sexual solicitations" came not from "predators" or adults but from other teens—in many cases the equivalent of teen flirting. When the study examined the type of Internet "solicitation" parents are most concerned about (e.g., someone who asked to meet the teen somewhere, called the teen on the telephone, or sent gifts), the number drops from "one in five" to just 3 percent.

This is a far cry from an epidemic of children being "approached by online predators." As the study noted, "The problem highlighted in this survey is not just adult males trolling for sex. Much of the offending behavior comes from other youth [and] from females." Furthermore, "Most young people seem to know what

to do to deflect these sexual 'come ons.'" The reality is far less grave than the ubiquitous "one in five" statistic suggests.

## Recidivism Revisited

Much of the concern over sex offenders stems from the perception that if they have committed one sex offense, they are almost certain to commit more. This is the reason given for why sex offenders (instead of, say, murderers or armed robbers) should be monitored and separated from the public once released from prison. While it's true that serial sex offenders (like serial killers) are by definition likely to strike again, the reality is that very few sex offenders commit further sex crimes.

The high recidivism rate among sex offenders is repeated so often that it is accepted as truth, but in fact recent studies show that the recidivism rates for sex offenses is not unusually high. According to a U.S. Bureau of Justice Statistics study ("Recidivism of Sex Offenders Released from Prison in 1994"), just five percent of sex offenders followed for three years after their release from prison in 1994 were arrested for another sex crime. A study released in 2003 by the Bureau of Justice Statistics found that within three years, 3.3 percent of the released child molesters were arrested again for committing another sex crime against a child. Three to five percent is hardly a high repeat offender rate.

In the largest and most comprehensive study ever done of prison recidivism, the Justice Department found that sex offenders were in fact less likely to reoffend than other criminals. The 2003 study of nearly 10,000 men convicted of rape, sexual assault, and child molestation found that sex offenders had a re-arrest rate 25 percent lower than for all other criminals. Part of the reason is that serial sex offenders—those who pose the greatest threat—rarely get released from prison, and the ones who do are unlikely to re-offend. If released sex offenders are in fact no more likely to re-offend than murderers or armed robbers, there seems little justification for the public's fear and the monitoring laws targeting them. (Studies also suggest that sex offenders living near schools or playgrounds are no more likely to commit a sex crime than those living elsewhere.)

While the abduction, rape, and killing of children by strangers is very, very rare, such incidents receive a lot of media coverage, leading the public to overestimate how common these cases are. (See John Ruscio's article "Risky Business: Vividness, Availability, and the Media Paradox" in the March/April 2000 SKEPTICAL INQUIRER.)

## Why the Hysteria?

There are several reasons for the hysteria and fear surrounding sexual predators. The predator panic is largely fueled by the news media. News stories emphasize the dangers of Internet predators, convicted sex offenders, pedophiles, and child abductions. The Today Show, for example, ran a series of misleading and poorly designed hidden camera "tests" to see if strangers would help a child being abducted.[1] Dateline NBC teamed up with a group called Perverted Justice to lure potential online predators to a house with hidden cameras. The program's ratings were so high that it spawned six follow-up "To Catch a Predator" specials. While the many men captured on film supposedly showing up to meet teens for sex is disturbing, questions have been raised about Perverted Justice's methods and accuracy. (For example, the predators are often found in unmoderated chatrooms frequented by those looking for casual sex—hardly places where most children spend their time.) Nor is it surprising that out of over a hundred million Internet users, a fraction of a percentage might be caught in such a sting.

Because there is little hard data on how widespread the problem of Internet predators is, journalists often resort to sensationalism, cobbling a few anecdotes and interviews together into a trend while glossing over data suggesting that the problem may not be as widespread as they claim. But good journalism requires that personal stories—no matter how emotional and compelling—must be balanced with facts and context. Much of the news coverage about sexual predation is not so much wrong as incomplete, lacking perspective.

## Moral Panics

The news media's tendency toward alarmism only partly explains the concern. America is in the grip of a moral panic over sexual predators, and has been for many months. A moral panic is a sociological term describing a social reaction to a false or exaggerated threat to social values by moral deviants. (For more on moral panics, see Ehrich Goode and Nachman Ben-Yehuda's 1994 book Moral Panics: The Social Construction of Deviance.)

In a discussion of moral panics, sociologist Robert Bartholomew points out that a defining characteristic of the panics is that the "concern about the threat posed by moral deviants and their numerical abundance is far greater than can be objectively verified, despite unsubstantiated claims to the contrary." Furthermore, according to Goode and Ben-Yehuda, during a moral panic "most of the figures cited by moral panic 'claims-makers' are wildly exaggerated."

Indeed, we see exactly this trend in the panic over sexual predators. News stories invariably exaggerate the true extent of sexual predation on the Internet; the magnitude of the danger to children, and the likelihood that sexual predators will strike. (As it turns out, Attorney General Gonzales had taken his 50,000 Web predator statistic not from any government study or report, but from NBC's Dateline TV show. Dateline, in turn, had broadcast the number several times without checking its accuracy. In an interview on NPR's On the Media program, Hansen admitted that he had no source for the statistic, and stated that "It was attributed to, you know, law enforcement, as an estimate, and it was talked about as sort of an extrapolated num-

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# Should the NHS Provide Complementary Therapy?

EDZARD ERNST

On May 23, Prince Charles addressed the World Health Organization (WHO) in Geneva. Officials at Clarence House said the Prince was gratified that the WHO had invited him to promote the cause of complementary therapies, a subject close to his heart for more than two decades. Back in 1982, he urged the British Medical Association to consider the subject more seriously. And so it did—the subsequent report was a damning account concluding that complementary medicine was based on little more than crank theories.

Today the climate has changed fundamentally. Complementary therapies seem to be encouraged everywhere. A government-sponsored patient guide published by the Prince of Wales's Foundation for Integrated Health reads like a promotional brochure for complementary practitioners. The recent "Smallwood Report," which was commissioned directly by Prince Charles (and funded by Dame Porter), goes one decisive step further: it advocates homeopathy as "an alternative" to conventional asthma treatments. And in his WHO address, Prince Charles again spoke out in favor of complementary medicine: "We need to re-discover and re-integrate some of the knowledge and well-tried practices that have been accumulated over thousand of years."

With all this plugging and promoting, few people seem to bother about the scientific evidence. Is there, for instance, reasonable proof that homeopathy treats asthma effectively? If not, such advice could actually kill hundreds of British asthma patients per year! The answer is that the totality of the best evidence available today fails to show that homeopathy works for asthma. We therefore have a case in which the current trend toward "integrated health" is disclosed as being detrimental to the health of the nation.

Nonetheless, "integrated healthcare" is being pushed at all cost as the new buzzword for providing complementary medicine to the masses. According to Prince Charles, "We need to harness the best of modern science and technology, but not at the expense of losing the best of what complementary approaches have to offer. That is integrated health—it really is that simple." In his WHO address he put it differently: "I believe that the proper mix of proven complementary, traditional, and modern remedies, which emphasizes the active participation of the patient, can help to create a powerful healing force for our world."

This statement, it seems to me, is in fairly good agreement with the view expressed in a recent letter by thirteen British doctors (I was one of them) to all National Health Service (NHS) trusts. We urged the NHS to use those treatments (complementary or orthodox) that are backed up by good evidence and abandon those that are not. In other words, we did something entirely obvious and legitimate: we advocated the application of the rules of evidence-based medicine and pleaded for a single standard in healthcare. One could argue that Prince Charles's public statements are a lay person's expression of the concepts of evidence-based medicine. Great! I am delighted. But let's be honest. If he means what he says, he should forthwith instruct all who work for him to stop promoting unproven or disproven treatments.

My team and I have researched complementary treatments for thirteen years. We have found many that generate more good than harm and many that don't. In the second edition of our Desktop Guide to Complementary and Alternative Medicine (just published by Elsevier), we summarize the evidence in fifty-two different situations where one complementary therapy or another is unquestionably effective and many others where effectiveness is likely. If we all, including Prince Charles and his Foundation for Integrated Health, use this type of evidence wisely we can maximize the benefits of complementary medicine with minimal risk. But this approach requires critical analysis rather than unquestioning belief—and we don't even need a new name for it. It's called evidence-based medicine.

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# Ghost Hunters

Belief that spirits of the dead exist and can appear to the living is both ancient and widespread, yet the actual study of ghostly phenomena has largely been lacking. So-called "investigation" has ranged from mere collecting of ghost tales to the use of "psychic" impressions to a pseudoscientific reliance on technology applied in a questionable fashion. Real science has largely been ignored.

## Collecting Tales

What passed for investigation in earlier times is illustrated by a "true" ghost story related by Pliny the Younger (ca. 100 a.d.). It has been "regarded as the first investigated ghost story" (Finucane 2001). A hearsay tale, already a century old when Pliny told it, it involved a house in Athens haunted by the specter of an emaciated, fettered man. It rattled its chains at night and brought disease and death to visitors. Undaunted, however, a stoic philosopher named Athenodorus bought the house, tried first to ignore the beckoning phantom, then calmly followed it into the garden where it vanished. The next day he had local officials dig at the site where they found a skeleton in rusty chains. After a proper burial which appeased the ghost, the haunting ceased.

But Pliny's tale is as suspect as it is dated, with its motifs of clanking chains, malevolent atmosphere, and ritual appeasement. Over time, people's notions of ghosts and hauntings have continually changed. According to R.C. Finucane, in his Appearances of the Dead: A Cultural History of Ghosts (1984, 223):

> Each epoch has perceived its specters according to specific sets of expectations; as these change so too do the specters. From this point of view it is clear that the suffering souls of purgatory in the days of Aquinas, the shades of a murdered mistress in Charles II's era, and the silent grey ladies of Victoria's reign represent not beings of that other world, but of this.

Figure 1. Paranormal investigator Vaughn Rees mimics ghost hunters, demonstrating how not to find a ghost. (Photo courtesy of Vaughn Rees.)

Even in a given era, ghosts seem to behave according to individual expectations, being as likely to walk through a wall as to knock on a door before entering (Finucane 1984, 223).

While collecting ghost stories can be helpful in showing just such trends, much that is claimed as the "investigation" of hauntings never rises above mere mystery mongering. Necessarily there is a reliance on anecdotal, eyewitness testimony. Moreover, accounts may be exaggerated and are frequently offered with the implication that the "unexplainable" phenomena are proof of the reality of spirits. Actually, such a view is an example of a logical fallacy called arguing from ignorance ("we don't know what caused the door to slam, therefore it was a ghost"). One cannot draw a conclusion from a lack of knowledge. Besides, an event may not be unexplainable at all, only unexplained, possibly later being solved (e.g., a slamming door might have been caused by a draft or may have been a prank).

Uncritical collections of ghost tales—rife with weaselly phrases like "is said to be" and "some believe that" (e.g., Hauck 1996, 1, 12)—are ubiquitous. They include Dennis William Hauck's Haunted Places: The National Directory (1996) and The International Directory of Haunted Places (2000), as well as a hundred or so books by "ghost hunter" Hans Holzer alone.

## The 'Psychic' Method

Actually, Hans Holzer sometimes goes beyond mere story relating, relying on alleged contact with the spirit realm. Belief in such contact is called spiritualism, and it is as ancient as the Old Testament's Witch of Endor who purportedly conjured up the ghost of Samuel

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at the request of King Saul (1 Sam. 28:7–20). Modern spiritualism began in 1848 at Hydesville, New York, when two young girls, Maggie and Katie Fox, pretended to communicate with the ghost of a murdered peddler. Although four decades later they confessed how their "spirit rappings" had been faked, in the meantime spiritualism had spread across the United States and beyond.

Interest in spiritualism inspired ghost hunting. The first organization devoted to the cause was a ghost society formed at Cambridge University in 1851. It was followed by London's Ghost Club in 1862, the Society for Psychical Research (SPR) in 1882, and an American counterpart (ASPR) in 1885. Such organizations attracted both scientists and spiritualists, many hoping to unite science and religion by validating spiritualist phenomena (Guiley 200, 6–7, 151–153, 353–354).

Out of that tradition comes Holzer, who terms himself a parapsychologist. In his book America's Haunted Houses he relates his "investigation" of Ringwood Manor in northern New Jersey. Holzer arrived at Ringwood with "psychic" Ethel Meyers in tow, a dubious choice given her involvement in the "Amityville Horror" case wherein she failed to realize it was a hoax. She supposedly made contact with former servants of Ringwood, saying that one, "Jeremiah," had "complained bitterly about his mistress," a Mrs. Erskine. However, the curator of Ringwood told me he doubted the house was haunted, and disparaged the notion that Mrs. Erskine mistreated any servant—whether "Jeremiah" or not. He observed that the present house was never seen by her, and "isn't even near the location of the original house!" (Prol 1993) Thus when Holzer writes, "The center of the hauntings seems to be what was once the area of Mrs. Erskine's bedroom" (Holzer 1991, 125), he betrays an utter lack of historical credibility.

Holzer, while a prolific mystery monger, is not the worst such offender. He observes: "Amateur 'investigators' can do more damage than good at times, "especially when they travel as 'demonologists' looking for demons and devils as the cause of a haunting" (Holzer 1991, 7).

He could be referring to an elderly couple, Ed and Lorraine Warren, who operate something they call the New England Society for Psychic Research. Ed, the director, has a business card that bills him as a "Demonologist." Lorraine, sporting a bouffant hairdo, claims to be a "clairvoyant." They have been called other things, ranging from "passionate and religious people" and "ghost hunters" to "scaremongers" and other appellations, including "charlatans" (Duckett 1991).

The Warrens' usual modus operandi has them arriving at a "haunted" house where ghost and poltergeist hijinks are blown into incredible accounts of "demonic possession." Soon the horrific tales become chapters or entire books touting the Warrens' "cases," such as the Amityville "horror," (Amityville, New York, 1975–1976) and the Snedeker family haunting (Southington, Connecticut, 1986–1988).

In the latter case, in addition to Lorraine Warren, "psychics" brought into the house (a former funeral home) included a Warren grandson and a nephew. They were soon reporting their own sightings of ghosts and other phenomena, while also denying that there was any book deal in progress. In fact, such a book did materialize (Warren and Warren et al. 1992).

Alas, when I appeared on the pre-Halloween 1992 Sally Jessy Raphael show with the Warrens and Snedekers, I began an investigation that would thoroughly demolish the case (although it was hyped again later with a made-for-TV movie). "Neighbors of the Snedeker" came on the Sally show to debunk many of the claims. One was an across-the-street resident, Kathy Altemus, who had kept a journal during the events and shared it with me when I subsequently visited Southington.

The journal shed light on the ghostly occurrences. For example, "vibrations" felt in in the house were easily explained by the passing of heavy trucks. Other events could perhaps be attributed to various passersby mentioned in the journal as "pulling pranks on the 'haunted house'" (Altemus 1988–92). Certain other incidents—including visiting nieces being groped by "an unseen hand"—turned out to have been caused by the Snedekers' son "Steven" (as he is called in the book). He confessed to police that he had fondled the girls as they slept. He used drugs and was diagnosed as schizophrenic (Nickell 1995, 133–139).

While there is no convincing evidence that demons were at work in the house, the arrival of the Warrens, with their publicity-seeking actions, convinced some people otherwise. Their book—written by a professional horror-tale writer and timed for Halloween release and promotion—was a travesty. It represented the worst of the "psychic" approach to ghost hunting.

As such evidence demonstrates—whether alleged psychics claim to enter a "trance" state, like Holzer's favorite mediums, Ethel Meyers and Sybil Leek (Holzer 1991, 24, 36), or whether they rely on "channeling tools" such as a Ouija board, dowsing rod, or psychic pendulum as others prefer (Belanger 2005, 17)—psychics have a poor track record. They typically offer unsubstantiated, even unverifiable claims, or information that can be gleaned from research sources or from knowledgeable persons by "cold reading" (an artful method of fishing for information). Alternatively, the psychic may simply make a number of pronouncements, trusting that the credulous will count the apparent hits and ignore, or interpret appropriately, the misses.

Still, not all such offerings are insincere. Those who fancy themselves psychics may exhibit traits associated with a "fantasy-prone" personality—a designation for an otherwise normal person's heightened propensity to fantasize. Some field research I have done shows a correlation between the number and intensity of ghostly experiences on the one hand and the number of exhibited traits associated with fantasy-proneness on the other (Nickell 2000).

## Ghostbusters

With the resurgence of spiritualism in the mid-nineteenth century, mediums sought to prove the existence of spirits through certain physical phenomena. Allegedly in dark-room séances, spirits materialized, spoke, wrote messages on slates, posed for photographs, and produced apports (teleported objects)—or so it appeared. Magician Harry Houdini (1874–1926) spent his last years crusading against such

phony spirit tricks (Nickell 1995, 17–38).

One of the first to use "modern technology" for ghost hunting was England's Harry Price (1881–1948). Marrying a wealthy heiress, he was able to indulge his interests in spiritualism and psychical research. A member of the SPR, he became disgruntled with the society's skepticism of physical phenomena and set up his own research laboratory.

For ghost hunting, Price employed such devices as a camera with infrared filter and film, a remote-control motion-picture camera, "a sensitive transmitting thermograph, with charts, to measure the slightest variation in temperature in supposed haunted rooms," and an electric signaling instrument to reveal the "movement of any object in any part of the house" (Price 1940, 6–7).

Despite his gadgets, Price still was unable to prove the reality of ghosts. Worse, he "is suspected of fraud in connection with several of his investigations, including the most famous one, the Borley Rectory haunting" (Guiley 2000, 299), which he wrote about in his The Most Haunted House in England (1940). (For a discussion, see Dingwall et al. 1956.)

Ghost hunting began to be popular in the late 1970s with the founding of the Chicago-area Ghost Tracker's Club. It became the Ghost Research Society (GRS) in 1981, being headed the following year by Dale Kaczmarek, a former Army chaplain's assistant turned grocery-distribution employee. According to The Encyclopedia of Ghosts and Spirits (Guiley 2000, 157), "most GRS members, including Kaczmarek, have seen enough unexplained phenomena to conclude that ghosts do exist and that there is survival after death"—a typical example of arguing from ignorance.

The popularity of the Ghostbusters movie of 1984 may have boosted the proliferation of ghost clubs. Some include psychics and dowsers, but virtually all utilize high-tech equipment for the supposed detection of ghostly "energy." Unfortunately, that is unknown to science, and the approach of the typical ghost hunter—a nonscientist using equipment for a purpose for which it was not made and has not been shown to be effective—is sheer pseudoscience.

Space permits only a brief overview of their alleged findings and the equipment involved.

Ghost photos. The earliest photographs —daguerreotype (from 1839), ambrotypes (1855) and tintypes (1856)—did not show ghosts. However, following the advent of glass-plate negatives, which permitted double exposures, in 1862 a Boston engraver named William H. Mumler began to produce "spirit" photos. He was revealed a fraud when some of his spirit "extras" were recognized as living Bostonians. Various means of faking ghost photos followed. As well, unintended ghostly effects have been caused by imperfections in film or camera or by conditions under which the photo was made (Nickell 1994, 146–159). Some "ghosts" are only simulacra—faces or other shapes perceived due to the mind's tendency to "recognize" images in random patterns (Nickell 2004).

Orbs. Typically unwitnessed but showing up in photographs—especially flash photos—orbs are bright spheres touted as "spirit energy" (Belanger 2005, 342). In fact however, orbs are easily made anywhere (as I have done in experimental photographs). When they are not mere reflections from shiny surfaces, they most often result from the flash rebounding from particles of dust or droplets of water close to the lens (Nickell 2002). The characteristics of orbs can vary, depending on how they are photographed. Orbs are more likely to be caused by cameras having the flash located close to the lens, according to Fujifilm (What's 2006). Also, digital cameras, having a greater depth of field, may be a more frequent offender (Orbs 2006). Responding to the evidence, some ghost hunters now claim to be able to differentiate "genuine" ghost orbs from "false orbs" (Guiley 2000, 270), while still being unable to prove the existence of the former.

Ectoplasm. Ghost hunters often tout the existence of "ectoplasm"—originally a substance supposedly extruded from the body of a medium. It was shown in photographs, extending umbilical-like from the medium's mouth, nose, or ears, but again and again it was revealed to have been faked with strips of gauze, chewed-up paper, concoctions of soap and gelatin, etc. (Guiley 2000, 116–117). Ghost hunters have seized on ectoplasm as a pseudo explanation for various strand and mist effects in photos. Such effects can be caused by the flash rebounding from the camera's wrist strap, jewelry, hair, insects, a wandering fingertip, etc., etc. (Nickell 1996; 2002). Or they may be due to other glitches.

Spirit energy. In addition to photography, ghost hunters search for their elusive quarry with a panoply of devices, notably electromagnetic field (EMF) meters. These are highly sensitive and—depending on the model—can be influenced by a number of very real energy sources, including faulty electric wiring, inadvertently magnetized objects (such as a metal bed frame), radio waves, microwave emissions, solar activity, electrical thunderstorms, and many other influences—even the human body! Watching hapless ghost hunters on TV crocumentaries, one often sees them operating EMF meters while holding them in the hand and moving about—a sure recipe for "unexplained" (to them) fluctuations. See figure 1.

Electronic Voice Phenomena (EVP). Following the nineteenth-century attempts to amplify spirit voices with tin trumpets, Thomas A. Edison suggested it might be possible to make an electronic device that permitted spirit communication (Gardner 1996). That never materialized, but today's ghost hunters make audiotape recordings of what they believe are "voices of the dead." These are unheard during taping but are manifested on playback. Skeptics contend they are either voices from radio, television, or two-way radio transmissions, or that they are imagined. Like visual simulacra, syllable-like effects may be perceived in the randomness of static and background noise (Guiley 2000, 120–121; Flynn 2006).

Cold spots. Ghost buffs tout temperature fluctuations and "cold spots" as evidence a house is haunted. Supposedly, they indicate areas where ghosts reside, and in the past they were picked by alleged psychics. To counter the inherent subjectivity of such an approach (a spooky place may give one "cold chills"), modern ghost hunters employ heat sensors, such as digital thermal scanners which mea-

sure instant temperature changes. The practice persists despite a lack of scientific evidence or theory to support equating the temperature with ghosts and the fact that temperatures can vary throughout a building due to normal causes (Warren 2003, 171–172; Guiley 2000, 155; Baker 1992, 123).

The pseudoscientific approach is presented—one might almost say caricatured—by a ghostly reality show airing weekly on the Sci-Fi Channel. Called Ghost Hunters, it features two hapless paranormalists—Jason Hewes and Grant Wilson—who, by day, are Roto Rooter plumbers in New Jersey, and, by night, leaders of The Atlantic Paranormal Society (TAPS). With some skepticism to enhance overall credibility (a token nonbeliever on each show), the duo present "evidence" for alleged hauntings.

Apparently ignoring my debunking of the "haunted" Myrtles Plantation in Louisiana (Nickell 2003), they visited the site for their second-season premier, July 27, 2005. Among their presentations was a video sequence of a lamp gliding across a table in the plantation's "slave shack." Many viewers were outraged, according to Television Week (Hibbard 2005, 19):

> Upon close inspection, fans concluded, the lamp was being pulled by its own cord. Even worse: a night-vision shot appears to show the cord extending from behind the table to Mr. Wilson's hand. And the so-called slave shack, Internet researchers said, was built recently and never housed slaves.

A Sci-Fi programming executive said lamely, "It's definitely important to us that this show is not manufacturing anything, and our assurance comes from those doing that show, because it's even more important to them—Jason and Grant's reputations are riding on this more than anybody's." He added, "I believe the show is real and I'm the biggest skeptic, out there."

## Scientific Investigation

The scientific approach to hauntings does not begin with the unproven, seemingly contradictory notion that entities are at once nonmaterial and quasi physical. Rather, in scientific inquiry one seeks to gather, study, and follow the evidence, only positing a supernatural or paranormal cause when all natural explanations have been decisively eliminated. Investigation seeks neither to foster nor debunk mysteries but instead to solve them.

This approach can involve scholarly methods (such as historical research and folkloristic analysis) as well as scientific techniques like those used in crime-scene investigation. Indeed, in pursuing the Atlanta House of Blood mystery of 1987, I learned that after the suburban home was reported to spurt blood "like a sprinkler," police had taken samples and made photographs. I was able to have the latter subjected to blood-pattern analysis. It revealed that the blood had not sprung from the floors and walls as alleged by the residents but indeed had been squirted onto the surfaces—indicating a hoax (Nickell 1995, 92–97).

Another hoax was uncovered by simple interrogation. This was an Indiana case I investigated with my friend and colleague the late Robert A. Baker, famed psychologist and inveterate ghostbuster. The subject, a little boy questioned by Baker, soon blurted out, "You aren't going to tell on me are you?" (The answer was no, and the matter was handled diplomatically; see Nickell 2001, 219.)

On-site investigation solved my first haunting case, that of the Mackenzie House in Toronto in 1972. Caretakers abed late at night really were hearing footsteps on the stairs when there was no one else in the house. But the footfalls were coming from a parallel iron staircase in the adjacent building (Nickell 2001, 217).

As shown by these and other closed cases (I call them "ex-files"), it is the scientific approach that solves mysteries. Indeed, we could see the advance of science as a progression of solved mysteries.

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# One More Take on Reductionism vs. Holism

Do you think that nature is characterized by complex systems that interact with each other and whose properties are not immediately reducible to the individual constituents? Or do you subscribe to the idea that the whole is in fact just the sum of its parts, so that one can focus on a part at a time and later put together the larger puzzle? In the first case, you are a holist; in the second, a reductionist.

The philosopher René Descartes was the first explicit reductionist, when he suggested in his Rules for the Direction of the Mind (1625–1628) that "[the scientific] Method consists entirely in the order and arrangement of those things upon which the power of the mind is to be concentrated in order to discover some truth. And we will follow this method exactly if we reduce complex and obscure propositions step by step to simpler ones and then try to advance by the same gradual process from the intuitive understanding of the very simplest to the knowledge of all the rest" (Rule V).

Descartes's method has been incredibly fruitful in the physical sciences, from particle physics to chemistry to molecular biology. But its application has been challenged and resisted in the so-called "special" sciences, such as organismal biology and the cognitive sciences. It simply strikes many biologists and psychologists as rather absurd to ignore or oversimplify what they consider their real target of study: the complex interactions among organisms and environments that result in an endless variety of forms and behaviors. As the poet Thomas Bailey Aldrich put it, "We vivisect the nightingale,/ To probe the secret of his note."

The philosopher Robert Brandon has proposed a new way of looking at the holism/reductionism debate, as well as a very sensible solution—both of which have largely been ignored since their publication in his 1996 book, Concepts and Methods in Evolutionary Biology. Brandon suggests that the proper way to see the debate, and to understand the persistent appeal of both positions, is that reductionists are making a methodological claim, while holists are defending an ontological position. And they happen to both be (partially) right. Methodologically—that is as a way to go about actually doing science—reductionism has a stunning record of successes throughout the twentieth century, while holism has little or nothing to show for it. Ontologically, however, in terms of the actual makeup of the stuff that we study, it's clear that biological systems are in fact intrinsically complex and interacting, and the idea that they display "emergent properties" that cannot be reduced to the sum of individual components is no longer controversial. The two parties, according to Brandon, have simply been talking past each other, carrying out two parallel debates, each one being a clear winner on its own turf.

However, there is a third approach, one that Brandon labels mechanism. This is the idea that both methodologically and ontologically, the best thing to do is to be flexible. Reductionism begins with the (unwarranted) assumption that it is always possible to reduce complex systems to the properties of simple parts; at the opposite end, holism begins with the (equally unwarranted) assumption that the world is inherently complex and does not admit of reductionist explanations. Mechanism is a happier middle ground, where the scientist (and the philosopher) negotiate the proper level(s) of analysis, depending on what nature actually tells us. So, for example, it is certainly true that living organisms are made—fundamentally—of quarks. But it is equally obvious that to attempt a description of their properties at that level of analysis, say a quantum account of apples, would be foolish (and, in fact, has never been attempted even by the most ardent reductionist). At the same time, no matter how many interactions and emergent properties living systems display, it is undeniable that there are some lower levels of analysis (that of

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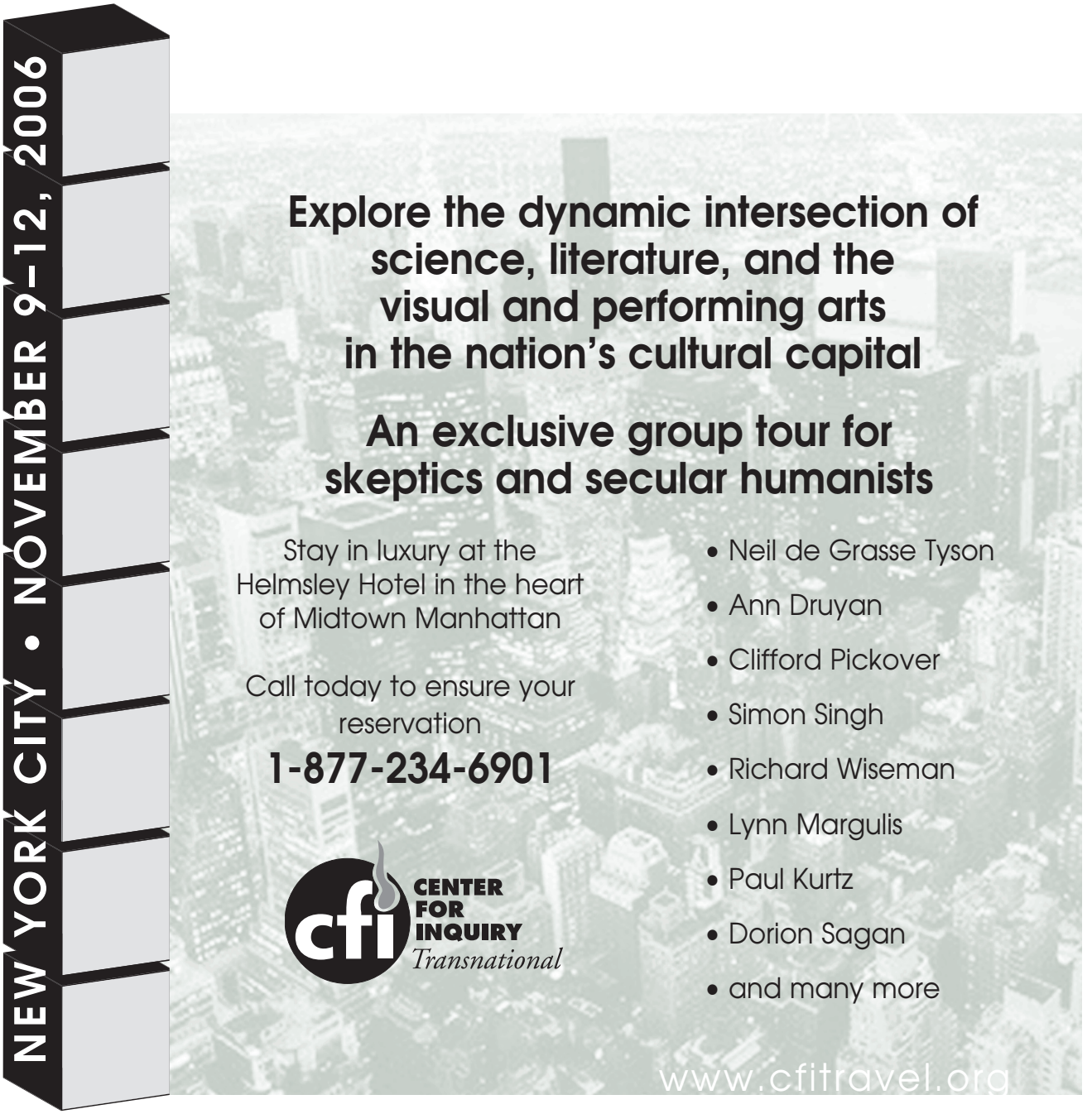
molecules for much of genetics or that of species for community ecology) that offer sufficient insights for us to feel like we are making progress in understanding the world.

Mechanism, in Brandon's conception, is the philosophical position that, both methodologically and ontologically, there are in fact several levels of analysis and complexity in the world and that scientists should not begin by assuming how many levels there are and where they can be found. Rather, science can in part be construed as an attempt to reach a "reflective equilibrium" between its methodology/ontology and the way the world actually is. Moreover, unlike reductionism and holism, mechanism doesn't require that methodology and ontology go hand in hand. While it may be aesthetically pleasing to recognize the same levels of organization as both actually existing in nature and those at which our methods are most effective, there is no practical or theoretical reason to do so. It may very well be, for example, that there is a limited number of actual levels of organizations in the world (ontology) but that we need to conduct our studies at more levels (methodology) because of our epistemic limitations as human beings. After all, there is no guarantee that the universe is made in a way to facilitate our understanding, despite the repeated (and rather irritating) claims of physicists and cosmologists that they can "see into the mind of God."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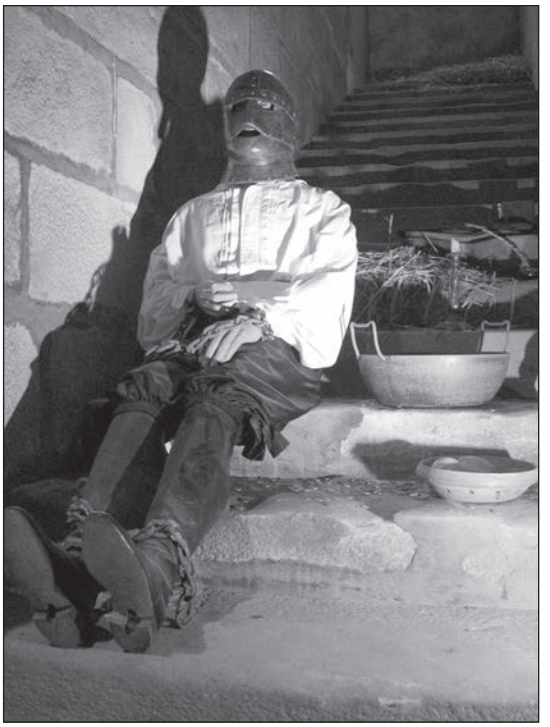
# Behind the Mask

A masked man lived in the Bastille for years and, still wearing a mask, there he died. Two Musketeers were at his sides, ready to kill him if he took his mask off. He ate and slept wearing the mask. There must have certainly been some good reason for this custom, for nonetheless he was well treated, well taken care of and he was given everything he asked for.



It was Charlotte Elisabeth, Duchesse d'Orleans and cousin to King Louis XIV, who wrote these words on October 15, 1711. It is probably the first written reference to a man with a mask imprisoned at the Bastille, the terrible Parisian prison.

In one of his famous novels, Alexandre Dumas imagines that the three Musketeers save the Man in the Iron Mask and discover that he really is the twin brother of Louis XIV, Philippe, imprisoned by the king in order to prevent any claim on the throne by him. Is there any truth in such a story that, in the last 300 years, has nurtured over 200 books, dozens of movies, and a multitude of possible candidates?

## A Masked Musketeer?

Recently, thanks to Legend Detectives, a Discovery Channel series that I cohosted, I had a chance to meet in Paris with British historian Roger MacDonald. In his book, The Man in the Iron Mask, he has come up with an extraordinary solution to the mystery of the masked prisoner. "Since the early eighteenth century," says MacDonald, "rumors had been circulating in the prison of a famous masked prisoner. The famous French writer Voltaire spent some time here in 1717 and he published an article that strongly hinted that the Masked Man must have had a face so familiar that he would have been recognized by everyone in France—hinting very strongly that whoever it was looked like the king Louis XIV."

It is a fact that a man with his face covered by a mask truly existed, and we know this also thanks to the many letters that his gaoler, Benigne d'Auvergne de Saint-Mars, wrote to the French Minister of War, the Marquis de Louvois. Reading their correspondence, one finds out that our man had been arrested in 1699 and then imprisoned in Pinerol, now a town in northern Italy but at that time a French stronghold. He was then transferred by Saint-Mars to the Chateau d'Exilles, then on the Island of Saint Marguerite, just in front of the town of Cannes, then finally to the Bastille, where he died in 1703.

The question remains, who was this man who had been forced to wear a mask? Some fifty-two different identities have been proposed over the centuries. Some say he was an Italian spy, Antonio Ercole Mattioli, Secretary of State to the Duke of Mantua; others think he was the French Minister of Finances, Nicolas Fouquet, who was arrested for embezzlement; some even say he was the French playwright, Molière, who had ridiculed the powerful in his plays.

MacDonald believes he has the right answer: "I think that behind the mask there was a very famous man, someone who knew too much about the corruption and wickedness at the heart of the court of Louis XIV. Someone who had to be removed forever. And I am certain that this someone was none other than D'Artagnan, the famous musketeer."

Massimo Polidoro is an investigator of the paranormal, author, lecturer, and cofounder and head of CICAP, the Italian skeptics group. His Web site is at www.massimopolidoro.com.

D'Artagnan as well was a real historical figure, and he was the true inspiration for some of Dumas's novels. Yet it is well known that D'Artagnan died in the battle of Maastricht in 1673, so how could he be the masked prisoner?

"Coded letters show that Saint-Mars, the Iron Mask's gaoler—and D'Artagnan's former boss, was summoned to Maastricht on a secret errand," says MacDonald. "I contend it was to whisk D'Artagnan away to the prison at Pinerol; I think he was seriously injured at the Battle of Maastrich, but recovered. They then put a mask on his face to keep his identity hidden from Saint-Mars' staff, who were all former musketeers and might have helped him escape. My proof? For example, the fact the D'Artagnan's biographer, Courtilz, was imprisoned in the Bastille when the man in the iron mask was there: maybe the biography he wrote turned out to be so amazingly accurate because it was D'Artagnan himself (wearing the mask) who told him the story of his life."

Wouldn't it have been easier just to kill him?

"No," states MacDonald, "because Saint-Mars owed him—he'd been his boss after all—and I think it was him who had the idea of putting a mask over [D'Artagnan's] face."

## A Dangerous Prisoner?

MacDonald still has to convince the experts, who say that his are just conjectures without hard evidence. The solution to the mystery, they say, may then lie somewhere else. "If you read through the prison records," explains Jean-Christian Petit-Fils, France's leading Iron Mask historian, "you can find out who was imprisoned with Saint Mars, where and when and gradually as he is transferred you can work out the prisoners transferred with him. One name emerges from the list of Saint Mars' prisoners—the name of a man called Eustache Dauger, or Danger. However there are conflicting theories about who Eustache Dauger really was because two people seem to share the same name. And this makes it really confusing."

The first theory, popular for some years, was that the prisoner was Eustache Dauger de Cavoye, an impoverished aristocrat. "He seems to have been a bad sort and got mixed up with a very bad crowd," continues Petit-Fils. "We think he was a Satanist, and a supplier of poisons to the court. He knew all the scandalous goings-on and had to be silenced. It was an attractive theory but unfortunately a few years ago someone unearthed a record that proved he died in an asylum sometime between 1680 and 1689—far too early for him to be the Man in the Iron Mask, who died at least five years later, if not more."

As for the other candidate, his name might have been Eustache Danger, and there might have been a misspelling on the arrest warrant. But who was he? "Well quite who he was we still don't know," says Petit-Fils. "It seems likely he was a diplomat's valet who saw too much about the secret meetings between English Catholics and the French and had to be removed. What he saw, we just don't know, but it must have been so sensitive it could ruin the careers of several prominent noblemen."

And, whatever he did, the Minister of War had received very strict orders from the King himself about this Danger, for he wrote in a letter to Saint-Mars: "It is of the utmost importance to His service that [Danger] should be most securely guarded and that he should in no way give information about himself nor send letters to anyone at all. . . . You must yourself take to him, once a day, the day's necessities, and you must never listen, under any pretext whatever, to what he may want to reveal to you, always threatening to kill him if he ever opens his mouth to speak of anything but his day-to-day need."

But why have him wear a mask? "Some historians have suggested the mask was used as a weapon of fear," explains Petit-Fils. "That rumors were spread about him shows just how powerful the King was—that anybody, no matter how powerful, could be made to disappear if they didn't do the King's bidding."

## A Propaganda Weapon?

I later met in Cannes with possibly the best-known English historian on the Man in the Iron Mask, John Noone, in order to clear things up. "I think the secret of the mask was not to hide who he was, but who he was not," he told me. "I personally believe that the Iron mask was an invention of the gaoler, Saint-Mars. It was a publicity stunt to make himself seem important. He forced some nonentity to wear the mask so that rumors and gossip would spread of how important his prisoner was. It was a way of giving himself a special status. And if his prisoner was important—then by extension he must be important as well."

In effect, Saint-Mars started his career as a humble musketeer and finished it as the Governor of the Bastille. It is not surprising, then, that for all those years, Saint-Mars brought along with him, in each and every prison where he was sent as he climbed the ladder of his career, the prisoner with the mask. There also exists a document, dating back to 1687, describing an incident that took place in southern France, in a town called Grasse: "The prisoner was carried on a sedan chair on the shoulders of four prison guards, led by the gaoler riding a white mare. Chains ringed his hands and feet, and his face was hidden by a terrible mask of steel . . . in the old town the procession wound its way through the steps, passing through arched tunnels and opening onto large square. At the Place aux Aires they stopped for the prisoner to drink water from the three-tiered fountain."

If there really was a need to hide the prisoner's identity, reasons Noone, why was he literally displayed in public like an exhibit? It seems quite clear that Saint-Mars was using this stunt as a propaganda weapon, in order to make himself respected and thus boost his career.

"The irony," concludes Noone, "is that by the time his ploy succeeded he no longer cared. In 1698 he was appointed Governor of the Bastille, the pinnacle of a jailer's profession. But by that time he had lost his sons to war and was a broken, drunkard of a man."

## Further Reading

Noone, John. 1994. The Man Behind the Iron Mask. New York: Palgrave Macmillan.

Petit-Fils, Jean-Christian. 2002. Le Masque de

# Time Flies Like an Arrow, but Fruit Flies Like Bilked Bananas

At the 87th Annual Meeting of the American Association for the Advancement of Science (AAAS) Pacific Division at the University of San Diego, June 18–22, there was something very unusual on the program. An entire Technical Symposium, stretched out over three days, was devoted to the subject "Frontiers of Time: Reverse Causation Experiment and Theory." As explained in the abstract, "most physical laws are time-symmetric; that is, they formally and equally admit both time-forward and time-reverse solutions. Time-reverse solutions are distressing because they would allow the future to influence the past. . . . Experimental evidence for reverse causation is scarce and open to alternative explanations. The best (and perhaps only) evidence comes from parapsychology . . ." As in "clairvoyance," "psychokinesis," "remote viewing," etc.

However, anyone expecting to find new and exciting developments in the word of reverse causality would be at least mildly disappointed to find mostly the usual suspects presenting papers—and for the most part trotting out the usual evidence. I didn't hear every presentation, so it's possible I may have missed something important, although the discussion didn't reflect that. Russell Targ, famous for his long-discredited 1970s research at SRI International on the "Geller effect" (see Martin Gardner's Science: Good, Bad, and Bogus), was hailed by the group like an elder statesman. His colleague Elizabeth Raucher regaled the audience with anecdotes of amazingly successful remote viewing, but from her talk it was impossible to gauge the significance, if any, of the purported successes. She claimed results that were significant to "one chance in half a trillion," but gave no indication how that figure was arrived at, or what precautions were taken against error and fraud. In 1982, Targ and his then-colleague Keith Harary claimed to have had astonishing success using remote viewing to make money investing in silver futures. If the procedure has any validity, by now both should be at least billionaires. But for some reason the venture was discontinued at the height of its success, and Harary ended up suing Targ. Remote viewing seems to be a phenomenon that has been for decades "on the verge" of great success, but somehow never quite gets there.

University of Washington physicist John G. Cramer spoke on "Reverse Causation and the Transactional Interpretation of Quantum Mechanics," which is his new proposal for modeling and understanding quantum phenomena (which he admits cannot be tested, as its predictions are the same as those of quantum mechanics). In it, events have effects both forward and backward in time. He described an experiment using "entangled photons" from a UV laser beam where it may be possible to receive a signal 50 microseconds before it is sent (this scarcely gives the experimenter any time to change his mind and cancel its sending after the signal has been received). The details are in Cramer's talk on his Web site at http://faculty.washington.edu/jcramer.

Roger Nelson described the "Global Consciousness Project" that he established at Princeton University (http://noosphere.princeton.edu/). The Project has set up a worldwide network of random number generators, fondly known as "eggs," which continuously "flip" virtual "coins." The data has been collected and correlated since 1998. "The purpose of this project is to examine subtle correlations that appear to reflect the presence and activity of consciousness in the world." He presented data purporting to show that a very large nonrandomness in the data, reportedly the largest that his experiment had ever shown, began about four hours before the attacks of September 11, 2001, as if the world's consciousness were crying out in anguish before the hijackers even boarded the airplanes. "This network, which we designed as a metaphoric EEG for the planet, responded as if it were measuring reactions on a planetary scale. We do not know if there is such a thing as a global consciousness, but if there is, it was moved by

Robert Sheaffer's World Wide Web page for UFOs and other skeptical subjects is at www.debunker.com.

the events of September 11, 2001. It appears that the coherence and intensity of our common reaction created a sustained pulse of order in the random flow of numbers from our instruments," Nelson writes on his Web site. But he also told the audience about the need to "identify and exclude 'bad trials'" in his methodology, and there is much discussion about these "rotten eggs" on his Web site: "After out-of-bound trials have been removed, the mean and variance of each reg are checked for stability. Sections of reg data that do not pass stability criteria are masked and excluded from analysis. . . . When the rotten eggs and the out-of-bounds trials are removed, and the data are normalized using the empirical variance for each egg, the resulting curves accurately represent the behavior of true random sources." An independent analysis of the purported September 11 anomaly by E.C. May and James P. Spottiswoode concluded that "we do not find significant evidence that the GCP network's EGG's responded to the New York City attacks in real time. [Dean] Radin's computation of 6000:1 odds against chance during the events are accounted for by a not-unexpected local deviation that occurred approximately three hours before the attacks. We conclude that the network random number generators produced data consistent with mean chance expectation during the worst single day tragedy in American history." (Spottiswoode was at the symposium, but was not a speaker.)

Nelson showed a slide with yet another supposed data anomaly, this one for the Indonesian earthquake of May 27, 2006, just a few weeks before the symposium. When asked whether the much larger and more destructive earthquake in that region of December 2004 produced an even greater anomaly, Nelson replied that it did not, although there was some sort of data spike. He rationalized the difference as being perhaps because the destructiveness of that event was due more to a tsunami than an earthquake, which perhaps would not have as great an effect upon the global consciousness. Not only does it seem odd that a much less-destructive event would register a greater impact upon the global noosphere, but a news story of February 11, 2005, about Nelson and the project claims "the machines went wild once more" twenty-four hours before the big tsunami.

Nelson's colleague York Dobyns of Princeton Engineering Anomalies Research (PEAR) spoke on "Retrocausal Information Flow: Physical Consequences of Knowing the Future." He suggests that retrocausality is the "most parsimonious" explanation for the experimental results described here, which in essence means that the past is "malleable." Our memories reflect the current state of the past. In some sense this is comforting to me, because when I think about stupid mistakes I've made in the past, I realize that it still isn't too late to change them.

**York Dobyns of Princeton Engineering Anomalies Research spoke on "Retrocausal Information Flow: Physical Consequences of the Future," which in essence means that the past is "malleable." Our memories reflect the current state of the past.**

Got psi? Richard Shoup of the Boundary Institute spoke on "Physics Without Causality: Theory and Evidence." He reviewed some of the results of that group's online ESP test. It's at www.gotpsi.org/bi/gotpsi.htm, and anyone can participate. If you win anything, let us know. He says that while the results of the testing usually conform to chance expectation, occasionally there are wide variances suggestive of unknown factors operating. The subjects' card guessing got much worse just before the attacks of September 11, 2001, and got better afterward.

Engineering Professor Garrett Moddel of the University of Colorado in Boulder spoke on "Constraints Imposed on Retrocausation by Entropy and Information Considerations." He hypothesized that the "entropy of the receiver cannot decrease" as the result of receiving a time-reversed message. This sounds a lot like saying that the receiver cannot learn anything from it. He suggested that to make time-reversed information travel better in a channel, we should decrease the signal-to-noise ratio in it. Apparently backwards-traveling information flows better when accompanied by a whole lot of noise.

Jean E. Burns worked out calculations to show how many atoms would have to be affected to cause a neural event to occur in the human brain. At worst, it's a few thousand, perhaps only a few hundred. Whether retrocausal quantum effects can tickle human neurons is anyone's guess. She also speculated on the number of atoms that would have to be affected to cause a movement that is detectable by present-day microphones; again, it is a relatively modest number. If we can devise some way to listen today to tomorrow's stock market report, I'm very interested.

One skeptical observer told me that he has been coming to symposia of this kind for thirty years, because his friends

are firm believers. The message, he says, has changed little if any during this time: "We are just now starting to get breakthrough results, soon the whole world will recognize it. . . . But it will never happen!" he predicted. I told him that I've had very similar experiences going to UFO conferences over that same time period: Official "disclosure" of alien contact is typically said to be just around the corner. My book UFO Sightings contains a whole chapter about these predictions of an imminent "UFO revelation" that never occurs.

What did appear to me to have changed was the general consensus on the nature of the obstacles they face. It used to be that one could count on hearing a generalized denunciation of "skeptics" (and often specific individuals) being the biggest problem psi researchers faced. Not only do skeptics make it more difficult for them to obtain funding for their research, but skeptical opinions are sometimes said to actually inhibit psi. The problem is compounded when retrocausality is considered; a skeptic, reading the results of a successful psi experiment, may project skepticism backwards in time, and retroactively inhibit the result. But now, the researchers seem to agree that the biggest problems they must overcome are those inherent in the phenomenon itself. One difficulty mentioned repeatedly is bilking, a postulated tendency of the universe to preserve its temporal integrity. In some interpretations, nature abhors a paradox even more than it does a vacuum, and even where time travel or retrocausality occurs, natural laws will ensure that no paradox actually results. Consider the famous paradox where I go backwards in time and shoot my own grandfather. According to theories of bilking, that simply wouldn't happen, even if time travel did occur. Possibly the gun would misfire, or the bullet would miss. Maybe Grandpa might even shoot back, thereby removing the source of the difficulty. But something would go wrong with this attempt to weave a self-contradictory loop into the fabric of space-time. One participant raised the analogy of a theoretically zero-impedance transmitter inside a perfectly reflective box. "In theory," electromagnetic radiation would pour into the chamber and never dissipate, but in the real world something would leak, break down, short out, or melt. So it is held to be with retrocausality: if an action would result in a temporal paradox that in some sense threatened the causal integrity of the universe, it would simply fail to happen, just as you would fail trying to do anything else that would violate natural law. Bilking becomes especially interesting in interpretations involving the "many universe" theory of Everett and Wheeler. Should information or action from the future cause a temporal paradox, the observer is somehow shifted into a parallel universe in which the paradox does not occur.

**A reading the results of a successful psi experiment, may skepticism backwards in time, and retroactively the result.**

My overall impression was that some of the papers were simply playing games with semantics: we are shown how certain quantum events normally described using forward time can also be modeled as also occurring in reversed-time. But is there any physical consequence to this, beyond a clever syllogism? Also quite obvious was cherry-picking of the data presented. We were shown data that clearly seemed to represent significant events. But how significant are they in the full context of other data that is unremarkable? Why has evidence purportedly this solid not been replicated widely, and all doubt removed? In a few cases, gross speculation was in evidence. The distance between two widely-separated points might be shown to be zero in certain cases if complex numbers are used to describe the reference frame (because the squares of the complex components are negative and could cancel out the "normal" positive separation). Mathematical cleverness, to be sure, but we have no reason to believe that this has anything to do with the real world. Heisenberg, of course, got a real workout at this symposium. His Uncertainty Principle creates, in essence, a blanket under which we cannot see, and hence cannot have direct knowledge of the goings-on beneath it. But the problem is that the space under the blanket is extremely small, and nobody has ever shown how that space can be made big enough to accommodate the quantum elephants that it is desired to bring into the room.

Not having any precognitive powers, I cannot say for certain what the future will bring. However, it's a good bet that a similar symposium held thirty years from now will still be re-hashing the same "signal way down in the noise"—indeed, if Moddel is correct, psi can actually be improved by putting more noise in the channel. Of course, should future researchers perfect the use

# Go, Go, Ghost Gadgets

On the Sci-Fi Channel show Ghost Hunters, these guys run around with thermal imaging cameras, EMF detectors, and digital thermometers, jumping up and down whenever their gadgets do anything. What are they proving? Do any of these gizmos actually mean anything?

—T. Barefield

In 2003, while I was investigating a haunted house in Buffalo, New York, the owner of the house asked me what sort of equipment I was going to use. He had glanced in my duffel bag, which contained two cameras, a tape recorder, notebooks, a tape measure, a flashlight, and a few other items. Perhaps he was expecting to see a Negative Ionizer Ghost Containment backpack like the kind Bill Murray wore in Ghostbusters.

When it comes to searching for ghosts, you'd think that only the most reliable equipment would be used in an attempt to get solid evidence for something as mysterious and elusive as a spirit. Yet, in ghost hunting, often the less scientific the methods and equipment, the more likely a researcher is to find "evidence" for ghosts.

Self-styled ghost hunters use a variety of creative—and dubious—methods to detect their quarry's presence, including psychics. Psychics not only claim to locate ghosts but also to communicate with the spirits, who unfortunately don't provide any useful or verifiable [redacted]. Benjamin Radford is coauthor, with Joe Nickell, of Lake Monster Mysteries: Investigating the World's Most Elusive Creatures.

for scientific prestige, ghost hunters often use scientific equipment such as Geiger counters, Electromagnetic Field (EMF) detectors, ion detectors, etc. Yet the equipment is only as scientific as the person using it; you may own the world's most sophisticated thermometer, but if you are using it as a barometer, your measurements are worthless.

According to many ghost hunters I've met, and the Web site Prairieghosts.com, an EMF meter is "the most common device used by ghost hunters today and is considered the most reliable." They also recommend dowsing rods, which "are said to sway in the direction of an energy field. When the ghost is discovered, they are said to cross."

I spoke to Tom Cook, of Toms Gadgets.com, a British purveyor of "scientific" paranormal kits for the enterprising (and gullible) investigator. Starter kits begin at £105 (US$180) and reach up to £500 (US$850) for a custom ghost-hunting kit. (Negative Ionizer Ghost Containment packs were not listed.) I asked him what, exactly, was the scientific rationale behind the ghost-detecting equipment he sold. He replied, "At a haunted location, strong, erratic fluctuating EMFs are commonly found. It seems these energy fields have some definite connection to the presence of ghosts. The exact nature of that connection is still a mystery. However, the anomalous fields are easy to find. Whenever you locate one, a ghost might be present. . . . any erratic EMF fluctuations you may detect may indicate ghostly activity. Currently, there exists no device that can conclusively detect ghosts."

The logic is fatally flawed: if one area of a home is colder than another, that may indicate a ghost; if an EMF meter detects a field, that too may be a ghost; if dowsing rods cross, that might be a ghost. (Or maybe the dowsing rods detected water. Who would know?) You get the idea: just about any "anomaly," anything that anyone considers odd for any reason, from a sound to an EMF reading to a headache, can be considered evidence of ghosts in the context of a haunting.

The glaring flaw in all this—the big, skeptical elephant in the tiny, haunted room—is of course that no one has ever shown that any of this equipment actually detects ghosts. If a device could reliably determine the presence or absence of ghosts, then by definition, ghosts would be proven to exist. I own an EMF meter, but since it's useless for ghost investigations—it finds not spirits but red herrings—I use it in my lectures and seminars as an example of pseudoscience. The most important tools in this or any investigation are a questioning mind and a solid understanding of scientific principles.

Submissions can be sent to: **The Skeptical Inquiree, Skeptical Inquirer, P.O. Box 703, Amherst NY 14226 (or bradford@centerforinquiry.net).**

# The Neural Substrates of Moral, Religious, and Paranormal Beliefs

MARCELLO SPINELLA AND OMAR WAIN

orality, religion, and superstition are three important phenomena in life that overlap to some degree. They all involve strong beliefs and emotions, and play important roles in guiding behavior. They involve a complex interaction between cognition and emotion that can lead to adaptive or maladaptive actions. While they are strongly influenced by culture, not all individuals in a given culture subscribe to the same beliefs. Examining these phenomena from a biopsychosocial model—looking at their biological, psychological, and social/cultural bases—may help us to better understand them. While the psychological and social underpinnings of these phenomena have been researched for decades, their biological components have only recently started to be seriously examined.

Religion involves a variety of beliefs and behaviors including cosmology, morality, and those regarding practices and observances. Religious beliefs and practices are also typically associated with deep emotions such as fear, comfort, guilt, joy, and awe. While religious beliefs and practices are widespread throughout human history, their neurobiological basis is only beginning to be understood. Advances in neuroscience in the past few decades allow us, for the first time in human history, to examine what occurs in the human brain during complex mental phenomena, including those involved in religion.

**While involve moral codes, morality is a separate concept involving systems of ideas about right and wrong conduct. behavior and reasoning have also been shown to have neurobiological correlates.**

Saver and Rabin (1997) have extensively reviewed how neurological and psychiatric conditions affect religious experience. Epilepsy is a condition of repeated seizures occurring in the brain, producing excessive and chaotic discharges of electrical activity. In some individuals, seizures can evoke intense religious experiences, such as the feeling of a presence of a deity, a dreamlike state, or out-of-body experiences. Individuals with temporal lobe seizures can manifest increased interest in religion and philosophical concerns. Indeed, many historical religious figures described seizure-like symptoms. For example, St. Paul saw sudden bright lights, fell to ground, and heard voices. Religion-related phenomena in epilepsy may relate to activation and sensitization of sensory-limbic circuits in the brain. The limbic system represents emotion in the brain, so excessive activity would cause ordinary experiences to take on a deeper, more intensified meaning. As William James (1902) noted in The Varieties of Religious Experience, there is no special sense for religion, but rather it involves heightened significance of regular sensory perceptions.

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Others have cited neurological phenomena as a basis for religious experiences, including near-death experiences, hallucinogenic drugs, and delusional disorders such as schizophrenia, mania, and psychotic depression (Beyerstein 1988, Blackmore 1991). Pentecostal church followers who speak in tongues have shown excessive spiking activity in the temporal lobes of the brain, part of the limbic system. Most of the neurological phenomena associated with religious experience involve some form of over-activation of the limbic system, and correspondingly intensified experiences. Conversely, Alzheimer's disease is associated with a deterioration of the limbic system and those afflicted tend to lose interest in religion, even those who have exhibited a lifelong interest. Thus, Saver and Rabin concluded in their Limbic Marker Hypothesis that the emotional component of religion is represented in the limbic system of the brain, since excess activity increases religious interest while lack of activity decreases religious interest.

### Religiosity

Heightened religiosity has also been noted in individuals with obsessive-compulsive disorder (OCD) (Tek and Ulug 2001). OCD is known to involve dysfunction of prefrontal systems in the brain (Whiteside, Port, and Abramowitz 2004). Nervous system function relates to religious phenomena not only in people with neuropsychiatric illnesses, but also in healthy individuals as well. For example, healthy religious individuals were asked to read religious writings (the Bible or Qu'ran) and showed activation of the prefrontal cortex and parietal cortex of the brain (Azari et al. 2001). Highly religious Protestants show greater levels of obsessive-compulsive symptoms compared to atheists and agnostics (Abramowitz et al. 2004). From these beginnings, cognitive neuroscientists are beginning to model how diverse systems in the brain contribute to producing the variety of religious phenomena (Boyer 2003).

While religions involve moral codes, morality is a separate concept involving systems of ideas about right and wrong conduct. Moral behavior and reasoning have also been shown to have neurobiological correlates. For example, individuals engaging in moral reasoning tasks show activation of prefrontal systems of the brain (Greene et al. 2004). Activation of these regions suggests that reasoning through a moral dilemma has both emotional and cognitive components (e.g., whether or not to sacrifice one life in order to save others). Other studies have similarly found that moral reasoning depends on the function of the human prefrontal cortex (Moll et al. 2003). Further evidence for prefrontal systems in moral behavior comes from individuals with dysfunction in these regions. Various brain imaging and neuropsychological studies suggest that individuals lacking in morality, such as those with antisocial personality disorder and psychopathic characteristics, have prefrontal dysfunction (e.g., Vollm et al. 2004, Dolan and Park, 2002). Indeed, damage to prefrontal systems can cause psychopathic-like personality changes in a formerly healthy person, a condition called acquired sociopathy (Anderson et al. 1999).

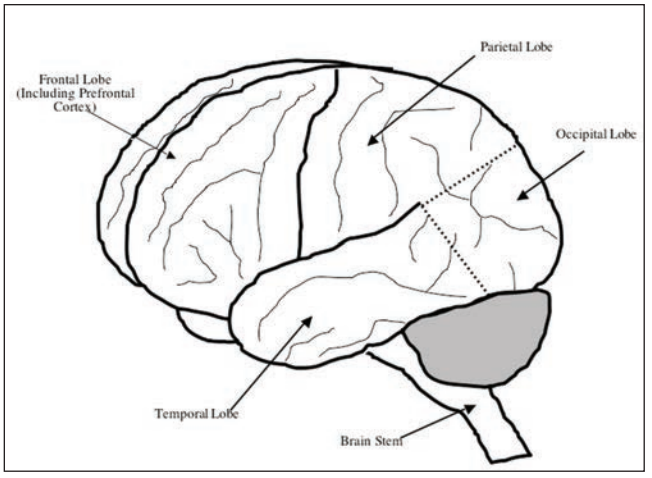

Figure 1: Side view of the human brain

## Superstition

Superstitious beliefs are commonly held ideas about paranormal or anomalous phenomena that are incompatible with scientific explanation. The neurobiological basis of paranormal beliefs has not yet been thoroughly investigated. Individual paranormal experiences may be dissociative in nature, and many cases are associated with abuse or other forms of childhood traumatic experiences (Irwin 1994, Ross and Joshi 1992). Superstitious beliefs are often irrational in nature and are contradictory to logical understandings of causality (e.g., black cats cause bad luck). In fact, such beliefs persist despite evidence to the contrary (Zebb and Moore 2003). Superstitious beliefs likely persist because of their emotional appeal, representing attempts to re-conceptualize distressing circumstances that are beyond an individual's control (Jahoda 1969).

Superstitious thinking is associated with disorders of cognition such as obsessive-compulsive disorder (Einstein and Menzies 2004a). However, this association is not limited to individuals with the disorder but exists to varying degrees in the general population (Einstein and Menzies 2004b). The neurobiology of OCD again suggests the possibility of prefrontal system dysfunction in superstitious thinking. Numerous brain imaging studies have shown that logical reasoning depends on prefrontal systems of the brain. Verbal analogy reasoning is known to activate prefrontal systems (Luo et al. 2003). Different regions of prefrontal cortex are involved in emotionally neutral reasoning compared to emotionally laden reasoning (Goel and Dolan 2003).

Thus, the prefrontal cortex appears to be critical to morality, religion, and superstitious thinking (figure 1). There are logical reasons why this structure plays such an important role in these and other activities. The prefrontal cortex is the frontmost region of the brain, located behind the forehead and above the eyes. It is proportionately larger in humans than any other animal and is essential for higher forms of thinking and reasoning. The area and associated deeper structures in the brain (such as the basal ganglia and thalamus) mediate what are collectively referred to as executive functions. These include mental abilities that are essential for autonomy and pursuing long-term goals. They include planning, organizing, impulse control, self-motivation, abstract reasoning, and mental flexibility (Tekin and Cummings 2002).

### Researching Executive Functions

Since the prefrontal cortex is involved in religious, moral, and superstitious thinking, my laboratory conducted research to determine whether executive functions relate to these phenomena (Wain and Spinella 2005). We decided to examine these relationships in a community sample, since clinical studies are illustrative but raise questions about applicability to the general population. While functional brain imaging studies provide vivid images of brain activity to relate to psychological phenomena, generalizing their results to the general public is hindered by the fact that they employ small numbers of research subjects and involve behavior outside of naturalistic settings (i.e., those done while sitting inside a brain imaging machine). To complement these types of studies, reliable and valid psychological measures can be used to see whether they produce results that accord with the above methods. An advantage of psychological tests is that they can efficiently be given to large community samples, filling in a gap left by clinical and brain imaging studies.

**The neurobiological basis of has not yet been thoroughly investigated. Individual paranormal experiences may be dissociative in nature, and many cases are associated with abuse or other forms of childhood experiences.**

In a sample of individuals from the college campus and local community, we measured executive functions (using the Executive Function Index), paranormal beliefs (Paranormal Beliefs Scale), religious beliefs (Traditional Religious Beliefs Scale, Belief in Divine Intervention Scale), and moral attitudes (Sociomoral Reflection Measure). Consistent with prior research, we found that people with greater religious beliefs reported greater paranormal beliefs and moral attitudes. However, a person's moral attitudes bore no relationship whatsoever to paranormal beliefs. Thus, moral attitudes and

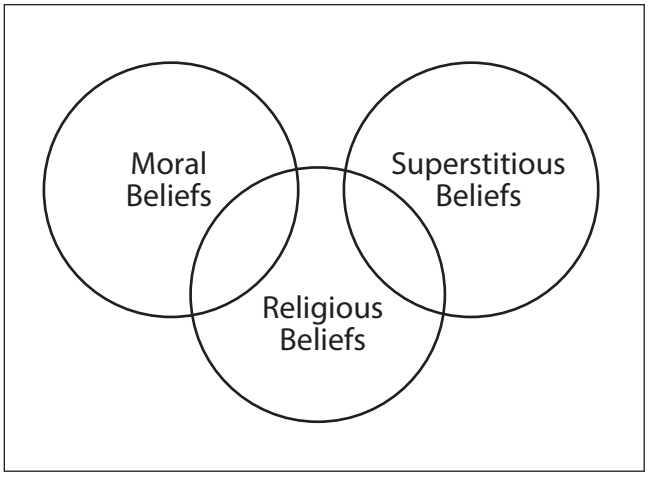


Figure 2: Overlap of religious, moral, and superstitious beliefs

**People with religious beliefs reported greater paranormal beliefs and moral attitudes. However, a person's moral attitudes bore no relationship whatsoever to**

superstitious beliefs appear to be two entirely separate entities, while religious beliefs partially overlap with both (figure 2). As anticipated, people with greater paranormal beliefs showed lower levels of executive function. Particularly, they had less impulse control and greater disorganization, independent of age, sex, or level of education. In contrast, people with greater moral attitudes showed greater executive functioning in all areas measured (motivation, impulse control, empathy, planning, and organization). These findings support studies suggesting that superstitious thinking involves some degree of dysfunction in the prefrontal cortex, even in the general population, while moral attitudes involve better prefrontal functioning. Traditional religious beliefs overall had little relationship to executive functioning. People with religious beliefs showed a minute increase in both empathy and impulse control, characteristics encouraged by most orthodox religions.

These findings have implications not only for the treatment of individuals with neurological and psychiatric illness but more importantly for the vast majority of healthy individuals. Despite their irrationality, superstitious and paranormal beliefs are remarkably persistent. Lapses in moral reasoning and behavior lead to greater social dysfunction, both on individual and societal levels. While religion may positively influence certain individuals, it is also evoked by others to commit harmful and antisocial acts such as racism, discrimination, terrorism, and murder. While philosophical and ethical discourse is essential to disentangle the related concepts of morality, religion, and superstition, it is instructive to understand it on a biological level as well. With a more complete picture of these phenomena on multiple levels, it may ultimately be possible to improve rationality and social cohesion through public health and education efforts.

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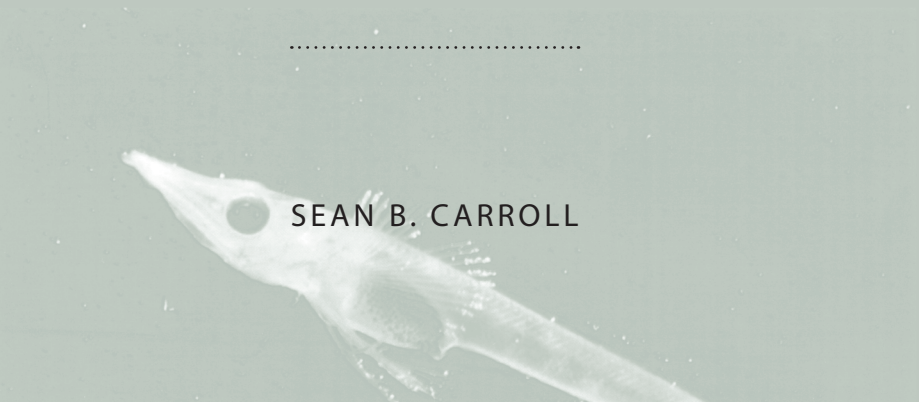
# The Bloodless Fish of Bouvet Island

## DNA and Evolution in Action

SEAN B. CARROLL



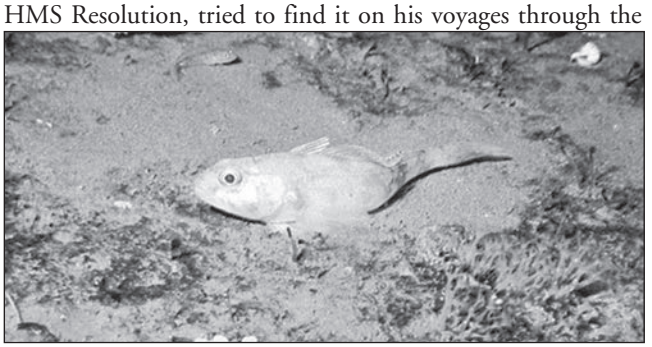
When we no longer look at an organic being as a savage looks at a ship, as at something wholly beyond his comprehension; when we regard every production of nature as one which has had a history: when we contemplate every complex structure and instinct as the summing up of many contrivances, each useful to the possessor, nearly in the same way as when we look at any great mechanical invention as the summing up of the labor, the experience, the reason, and even the blunders of numerous workmen; when we thus view each organic being, how far more interesting, I speak from experience, will the study of natural history become!

—Charles Darwin, The Origin of Species (1859)

It may be the most remote place on Earth. Tiny Bouvet Island is a lone speck in the vast South Atlantic, some 1,600 miles southwest of the Cape of Good Hope (Africa) and almost 3,000 miles east of Cape Horn (South America). The great Captain James Cook, commanding the

Bouvet Island, where a bloodless icefish was discovered.

HMS Resolution, tried to find it on his voyages through the


An icefish

Southern Ocean in the 1770s, but failed both times. Covered by an ice sheet several hundred feet thick that ends in sheer cliffs that drop to black volcanic beaches, and with an average temperature below freezing, it still doesn't get many visitors.

Fortunately, for both my story and natural history, the Norwegian research ship Norvegia made it to Bouvet Island in 1928, with the principal purpose of establishing a shelter and a cache of provisions for shipwrecked sailors. While on Bouvet, the ship's biologist Ditlef Rustad, a zoology student, caught some very curious-looking fish. They looked like other fish in most respects—they had big eyes, large pectoral and tail fins, and a long protruding jaw full of teeth. But they were utterly pale, almost transparent. When examined more closely, Rustad noticed that what he called "white crocodile fish" had blood that was completely colorless.

Johan Ruud, a fellow student, traveled to the Antarctic two years later on the factory whaling ship Vikingen. He thought the crew was pulling his leg when one flenser (a man who stripped the blubber and skin from the whale) said to him: "Do you know there are fishes here that have no blood?"

Playing along, he replied "Oh, yes? Please bring some back with you."

A good student of animal physiology, Ruud was perfectly sure that no such fish could exist, as textbooks stated firmly that all vertebrates (fish, amphibians, reptiles, birds, and mammals) possess red cells in their blood that contained the respiratory pigment hemoglobin. This is as fundamental as, well, breathing oxygen. So when the flenser and his friends returned from the day's efforts without any blodlaus-fisk (bloodless fish), Ruud dismissed the idea as shipboard lore.

Ruud returned to Norway the following year and mentioned the tale to Rustad. Much to his surprise Rustad told Ruud "I have seen such a fish" and showed him the photographs he had taken on his expedition.

Ruud heard nothing more about the bloodless fish for twenty years. Then, another Norwegian biologist returned from an Antarctic expedition with white-blooded fish from a different location. His curiosity reawakened, Ruud began to ask other colleagues voyaging to the Antarctic to be on the lookout for what the whalers called "devilfish" or "icefish," because of their near-transparency. Finally, Ruud returned to the Antarctic himself in 1953, almost twenty-five years after his first journey, with the hope of catching and studying these fish and resolving the mystery of their blood.

He set up a makeshift laboratory on South Georgia Island (the island to which explorer Ernest Shackleton rowed in 1916 in order to save the stranded crew of the Endurance). He promptly received a few precious specimens and carefully analyzed their odd blood. His findings, reported in 1954, are still a shock for any biologist reading them for the first time. The fish completely lacked red blood cells, the pigmented oxygen-carrying cells that, until the discovery of these Antarctic icefish, had been found in every living vertebrate. Indeed, no other case of bloodless vertebrate has ever been discovered outside of the fifteen or so species of icefish now known.

Red blood cells contain large amounts of the hemoglobin molecule, which binds oxygen as blood cells circulate through the lungs or gills, and then releases it as red cells circulate through the rest of the body. The hemoglobin molecule is made up of a protein called globin and a small molecule called heme. The red color of blood is due to the heme that is buried in the hemoglobin molecule and actually binds the oxygen. We would, and do, die without red cells (anemias are conditions of low red cell numbers). Even close relatives of the icefish, such as Antarctic rock cod and New Zealand black cod, are red-blooded.

The existence of these remarkable fish provokes many questions. Where, when, and how did they evolve? What happened to their hemoglobin? How can the fish survive without it or red blood cells?

The typical place one would begin to explore the origin of a species would be the fossil record. However, that is completely lacking for these fish and their relatives. And, even if we had fossils, we would not be able to tell, from the remnants of their

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bones, what color their blood was and when it changed. But, there is a record of the history of icefish that we can access—in their DNA.

The clear, stunning answer to the question of what happened to their hemoglobin came from the study of icefish DNA more than forty years after Ruud first sampled their blood. In these amazing fish, the two genes that normally contain the DNA code for the globin part of the hemoglobin molecule have gone extinct. One gene is a molecular fossil, a mere remnant of a globin gene—it still resides in the DNA of the icefish, but it is utterly useless and eroding away just as a fossil withers upon exposure to the elements. A second globin gene, one that usually lies adjacent to the first in the DNA of red-blooded fish, has eroded away completely. This is absolute proof that the icefish have abandoned, forever, the genes for the making of a molecule that nurtured the lives of their ancestors for over 500 million years.

What would provoke such a dramatic rejection of a way of life that serves every other vertebrate on the planet? Necessity and opportunity, both of which sprang from dramatic, long-term changes in ocean temperature and currents.

Over the past 55 million years, the temperature of the Southern Ocean has dropped, from about 68 degrees (F) to less than 30 degrees in some locales. About 33–34 million years ago, in the continual movement of Earth's tectonic plates, Antarctica was severed from the southern tip of South America, and became completely surrounded by ocean. Ensuing changes in ocean currents isolated the waters around the Antarctic. This limited the migration of fish populations such that they either adapted to the change, or went extinct (the fate of most). While others vanished, one group of fish exploited the changing ecosystem. The icefish are a small family within a larger group of 200 species (called the Notothenioidae) that now dominates the Antarctic fishery.

The low temperature of Antarctic waters presents some great challenges to body physiology. Like the oil in my car during a Wisconsin winter, the viscosity of body fluids increases in the subfreezing Antarctic water temperatures, which would make them difficult to pump. Antarctic fish, in general, cope with this problem by reducing the number of red cells per volume of circulating blood. Red-blooded Antarctic fish have hematocrits (the percentage of their blood volume made up of red cells) of around 15–18 percent, while we have hematocrits of about 45 percent. But the icefish have taken this to the extreme, by eliminating red blood cells altogether, and allowing their globin genes to mutate into obsolescence. These fish, whose blood is so dilute that it contains just 1 percent cells by volume (all white cells), literally have ice water in their veins! How does this creature cope with the absence of life-sustaining hemoglobin?

It is clear now that the loss of hemoglobin has accompanied a whole suite of changes in the fish that allows it to thrive at below-freezing temperatures. One of the important differences between warm and cold water is that oxygen solubility is much greater in cold water. The frigid ocean is an exceptionally oxygen-rich habitat. Icefish have relatively large gills, and have

Bouvet Island

evolved a scaleless skin that has unusually large capillaries. These two features increase the adsorption of oxygen from the environment. Icefish also have larger hearts and blood volumes than those of their red-blooded relatives.

Icefish hearts differ in another obvious and profound way—they are often pale. The rose color of vertebrate hearts (and skeletal muscles) is due to the presence of another heme-containing, oxygen-binding molecule called myoglobin. Myoglobin binds oxygen more tightly than hemoglobin and sequesters it in muscles so that it is available upon exertion. The muscles of whales, seals, and dolphins are so rich in myoglobin that they are brown in color, which allows these diving mammals to stay submerged for long periods. But myoglobin is not a stand-in for the absence of hemoglobin in icefish. It is absent from the muscles of all icefish and the hearts of five species (hence their paleness). The myoglobin protein is encoded by a single gene in vertebrates. Analysis of the DNA of pale-hearted icefish revealed that their myoglobin gene is mutated—an insertion of five additional letters of DNA has disrupted the code for making the normal myoglobin protein. In these species, the myoglobin gene is also on its way to becoming a fossil gene. The fishes' many cardiovascular adaptations are providing sufficient oxygen delivery to body tissues in the complete absence of two fundamental oxygen-carrying molecules.

Life in very cold waters demands yet further accommodations, and the unmistakable evidence of evolutionary change is found in many more places in icefish DNA. Even basic structures in each cell must be modified to adapt to life in the cold. For example, microtubules form a critical scaffold or "skeleton" within cells. These structures are involved in cell division, movement, and the formation of cell shapes. With so many important jobs to do, the proteins that form the microtubules are among the most faithfully preserved not just in all vertebrates, but in all eukaryotes (the group including, among others, animals, plants, and fungi). In mammals, microtubules are unstable at temperatures below 50°F. If this were the case in Antarctic fish, they would certainly be dead. Quite to the contrary, microtubules of Antarctic fish assemble and are very stable at temperatures below freezing. This remarkable change in microtubule properties is due to a series of changes in the

genes that encode components of the microtubules, changes that are unique to cold-adapted fish, both icefish and their red-blooded Antarctic cousins.

There are many more genes that have been modified so that all sorts of vital processes can occur in the subfreezing climate. But adaptation to cold is not limited to the modification of some genes and the loss of others; it has also required some invention. Foremost among these is the invention of "antifreeze" proteins. The plasma of Antarctic fish is chock full of these peculiar proteins. These proteins help the fish survive in icy waters by lowering the temperature threshold at which ice crystals can grow. Without them, the fish would freeze solid. The proteins have a very unusual and simple structure. They are made up of four to fifty-five repeats of just three amino acids, whereas most proteins contain all twenty different types of amino acids. Warm water fish have nothing of this sort, the antifreeze genes were invented by Antarctic fish.

**The making of the extraordinary illustrates the ordinary, if somewhat messy, course of at the DNA level.**

As a resident of a cold climate, I have to admire the icefishes' grit and ingenuity. We take various measures to keep our cars running on subzero Wisconsin days, but the icefish has managed to change its whole engine while the car was running. It invented a new antifreeze, changed its oil (blood) to a new grade with a remarkably low viscosity, enlarged its fuel pump (heart), and threw out a few parts along the way—parts that had been used in every model of fish for the past one-half billion years.

The making of the extraordinary icefish illustrates the ordinary, if somewhat messy, course of evolution at the DNA level. Icefish evolved from warm-water, red-blooded ancestors ill-suited to life in the cold. Their adaptation to the changing environment of the Southern Ocean was not a matter of instant design, nor just a one-way "progressive" process. It was an improvised series of many steps, including the invention of some new code, the destruction of some very old code, and the modification of much more.

The DNA record of icefish, and of all other species, is a whole new level of evidence of the evolutionary process. It allows us to see beyond flesh, bones, and blood, directly into the fundamental text of evolution. The rapidly expanding DNA record vividly demonstrates the key principle of evolution—natural selection—first articulated by another zoology student, Charles Darwin, who journeyed around the South Atlantic a century before Rustad and Ruud.

Darwin understood all too well most of the objections that could or would be raised against his idea of natural selection or what also became known as "the survival of the fittest." (Darwin did not coin that famous phrase, the philosopher Herbert Spencer did. It did not appear in The Origin of Species until the fifth edition.) Many of the attacks then, as they are now, were from those who found Darwin's view of life's history repulsive and demeaning on nonscientific grounds.

Even for those who weren't hostile, Darwin appreciated how difficult it was to conceive of a process that worked over a period of time beyond human experience:

> . . . the chief cause of our natural unwillingness to admit that one species has given birth to other and distinct species, is that we are always slow in admitting any great change of which we do not see the steps [emphasis added].
>
> —Ch. XIV, The Origin of Species

Just as for Johan Ruud and the tale of the bloodless fish of the Antarctic, for most of us believing and understanding is a matter of seeing. We want to see the stuff responsible for evolution. We want to be able to see, measure, and retrace the steps taken in evolution between one species and another.

Now, after 140 years, we can do just that.

Each step in evolution, we now know, is taken and recorded in DNA. Every change or new trait, from the antifreeze in the bloodstream of Antarctic fish, to the beautiful colors of an alpine wildflower, to our large brain-packed skulls, is due to one or more (sometimes many, many more) stepwise changes in DNA that are now traceable.

The ability to see into the machinery of evolution transforms how we look at the process. For more than a century, we were largely restricted to looking only at the outside of evolution. We observed external change in the fossil record and assessed differences in anatomy. But before this new molecular age there was no way to make genetic comparisons between species. We could study the reproduction and survival of organisms and infer the forces at work. However, we had no concrete knowledge of the mechanism of variation or the identity of the meaningful differences between species. Yes, we understood that the outcome was the survival of the fittest, but we did not know how the fittest are made. Just as for any work of human creation, we so much better understand how complex things have come to be—cars, computers, spacecraft—when we understand how they are made, and how each new model is different from its predecessors. We are no longer savages staring at passing ships.

### Why Evolution Matters

This new understanding of how the fittest are made expands our wonder at the processes that have shaped life's amazing diversity—from ancient microbes that live in boiling water,

to fish that breath without hemoglobin, birds and butterflies that see colors invisible to us, and apes that write books. It also reveals why and how the "fittest" is a conditional, if not precarious, status.

Natural selection acts only on what is useful for the moment. It cannot preserve what is no longer used, and it cannot predict what will be needed in the future. Living for the moment has the dangerous disadvantage that if circumstances change more rapidly than adaptations can arise, faster than the fittest can be made, populations and species are at risk.

History shows that as circumstances have changed, globally or locally, many era's fittest have been replaced. The fossil record is paved with creatures (e.g., trilobites, ammonites, dinosaurs, to name just a few of once very successful groups) that evolution has left behind. The icefish have made a remarkable evolutionary journey in adapting to the changing Southern Ocean, but theirs may well be a one-way trip. Having abandoned one mode of living, they have lost capabilities that cannot be recovered.

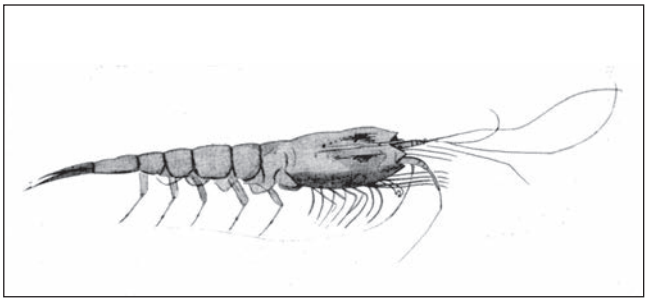
The main reason why Ditlef Rustad and Johan Ruud found themselves in the Southern Ocean was that declining whale stocks in northern waters forced Norway's whaling fleet to look elsewhere. Norway began whaling in the Antarctic's waters in the early 1900s, taking 236 whales between 1904 and 1906. This figure rose to 10,760 whales by 1912, and to 40,000 by 1940.

Whalers pursued one species after another as populations declined. For example, in 1930–1931, 29,000 blue whales were taken. The hunters moved on to the fin whale, the sei whale, humpback whales, and then minke whales. By the time most countries agreed to a moratorium an Antarctic whaling, the former population of 200,000 blue whales had been reduced to just 6,000 animals, the population of humpback whales was also reduced to the same small fraction, and the fin and sei whales reduced to 20 percent of their original numbers.

Rustad accidentally discovered icefish in nets he used to haul up krill, a 2–3 inch long crustacean at the center of the Antarctic food web (krill is Norwegian for whale food). Krill feed on phytoplankton and algae and are in turn eaten by squid, sea birds, whales, seals, and . . . icefish. Krill may be the most abundant animal on the planet. Vast swarms of krill may cover almost 200 square miles of ocean and contain 2 million tons of animals. A single cubic meter of a swarm can contain one million animals. However, long-term studies indicate that the density of krill has dropped by 80 percent over the past seventy-five years, which has raised considerable alarm among marine scientists. What is happening to the krill?

Air temperature in the Antarctic Peninsula has risen by four to five degrees in the last fifty years, more than five times the average rise across the globe. With that rise, there has been a decline in the mass of sea ice. Krill feed on algae that live on the sea ice, so it appears that the chain of dominoes is global warming sea ice melting less algae fewer krill.

Of course, as you are well aware, there are concerns that



A krill

the rise of air and water temperature and the loss of sea ice will continue unabated with global warming. Some scientists have forecasted a rise of up to five degrees over the next 100 years. In the Antarctic, this would certainly reduce the amount of sea ice available for algal growth, and stress both animal populations that depend on krill, as well as those that are cold-adapted.

What, then, is the fate of the marvelous icefish? These potential climate changes are worrisome enough, but the icefish has already experienced catastrophe. As the whaling industry died, attention turned to other Antarctic fisheries, including the icefish. The mackerel icefish Champsocephalus gunnari was fished beginning in 1971. By 1978, the catch had peaked at 235,000 tons. Then, the same sad fate that has befallen whales, turtles, dugongs, cod, swordfish, marlin, and other prized species in the twentieth century hit the icefish. The fishery collapsed and the catch dropped to 13,000 tons in 1991, and then to only 66 tons in 1992, with no subsequent recovery.

We might have saved the blue whale from extermination (after decades of dawdling and political wrangling), but we clearly did not learn the bigger lesson.

Whatever the fate of the icefish, it is clear that its recovery will require it to swim against the current of overfishing, ecosystem disruption, and climate change. With its physiology so tuned to the subfreezing water temperature, it is not clear whether its depleted populations could adapt to a substantial rise in water temperature over a period as short as a century, compounded by the added stress of decreased food sources.

Knowledge of evolutionary biology is therefore no mere academic or philosophical pursuit; it is the foundation of sustainable policies. Denial or ignorance of our effects on evolution, combined with the politics of self-interest, has clobbered many key economic species and the livelihoods of hundreds of thousands of people who depended on them. Extreme danger signs are flashing for many more species experiencing selection intensities that are greater than those to which the populations can adapt.

Yet, here we are at the opening of the twenty-first century, with the benefit of two centuries of evolutionary science, still debating the existence of evolution. And with more than two centuries of experience of the consequences of overfishing, overhunting, and pollution, chasing what few fish are left.

The late Nobel Laureate Sir Peter Medawar once stated that "the alternative to thinking in evolutionary terms is not to think at all." That is an alternative our species can no longer afford.

Excerpted and adapted from The Making of the Fittest: DNA and the

# Science Ain't an Exact Science

## Public Perception of Science in the Wake of the Stem-cell Fraud

DAVID KOEPSELL

We walk a fine line when we overemphasize the success and reach of science. We are all good fans of science and sometimes get awfully excited when we talk about it. It has gotten us far indeed, and the upward growth of science and technology promises to continue indefinitely. But we have to be realistic. When science goes wrong, or when scientists go bad, unrealistic expectations about science as an institution, or scientists as people, undermine public confidence in both. Sometimes it's a good idea to step back and assess objectively what the institutions, methods, and limitations of science really are, lest we oversell, create unrealistic expectations, and undermine science's longstanding success as the world's most successful epistemological methodology.

Many of us who regretted the federal government's withdrawal of funding from most stem-cell research here in the U.S. shook our heads at an opportunity apparently lost when Korean scientists announced their success in cloning embryonic stem cells. It seemed that the breakthrough by a foreign government's strongly supported research program was a winning argument for lifting our ban and once again funding the research. However, with revelations about the stem-cell fraud (involving Korean Dr. Hwang Woo Suk's numerous ethical lapses in obtaining and representing data), that argument may vanish, and there is a very real danger that public perception of the value of the science behind this potentially revolutionary technology will be lost in the shuffle.

### Crises of Faith

Critical junctures have occurred in the past half century that, taken together, have helped to undermine public trust in both science as an institution and scientists as trustees of the public good. We must remember that science is conducted primarily as a public benefit drawing upon public resources. Private investors, for the most part, do not pursue science. Private investment builds technology, but the basic science upon which most successful technology builds is paid for out of public money. The federal government conducts major research programs and funds basic scientific research through public institutions such as the National Institutes of Health, the National Science Foundation, and NASA, to name a few of the bigger bodies. Basic research is largely funded through grants awarded by these federal agencies rather than by private enterprise, because there is no necessity for profit when a project is funded by grants. Grants are meant only to stimulate discovery and research. Private enterprise thrives on profits, and basic research is often too risky to plunge venture capital into. Technology is farmed out eventually, thanks to legal creations such as patents, and some public losses from initial public investment are recouped thanks to efforts like the Bayh-Dole Act, which allows universities to hold and profit from patents.

Basic science has changed significantly, however, since the days of Vannevar Bush, who stated in 1945:

> The Government should accept new responsibilities for promoting the flow of new scientific knowledge and development of scientific talent in our youth. These responsibilities are the proper concern of the Government, for they vitally affect our jobs, our health, our security.

Vannevar Bush was head of the Office of Scientific Research and Development and recommended the creation of the National Science Foundation, which became a reality in 1950. His role in creating the ties between basic science, technology, and industry was remarkable, and much of the rapid progress of all three after World War II can be traced to his innovation in creating institutions. He was also involved in one of the big crises, which cost much of the faith of people around the world in the institutions and principles of science: the development of the atomic bomb.

Certainly, much of the backlash against science in the 1960s can be traced to two important movements, including the Committee for Nuclear Disarmament, which formed in the U.K. in 1958, and the public reaction to Silent Spring in 1962. Nuclear technology, which at the height of the Cold War could technically have destroyed human civilization and much of the biosphere, has arguably acted as a credible deterrent to world war ever since its development. And while they may have increased crop yields dramatically to keep pace with the demands of a growing population, chemical pesticides and their sometimes indiscriminate use in the name of the "green revolution" may have also harmed the environment before governmental regulation and a measure of corporate responsibility addressed the growing problem. In the 1970s, public awareness about and concern for the unchecked growth of science and technology led to greater governmental oversight of the applications of science through industry. In the 1980s, there was a bit of a lapse from the model of governmental oversight, but overall, since the early 1990s, there is more public oversight of technology as applied through the free market, and more conscientious self-regulation, than before public outcry over the twin concerns of nuclear war and environmental degradation.

**New threats to in science have come through a in fundamentalist religious sentiment and lapses by prominent scientists.**

New threats to public trust in the institutions and personnel of science have come at the beginning of the twenty-first century through a rise in fundamentalist religious sentiment and notable personal lapses by prominent scientists. Recently, these two threats to the public perception of science as a successful method of knowledge have culminated in visible and public attacks on the methodological foundations of science by organizations such as the Discovery Institute and its promotion of intelligent design. The Discovery Institute's so-called "wedge" document indicates that their ultimate target is scientific materialism—i.e., science—itself!

Further threats loom in the area of stem-cell research, also threatened by fundamentalism and that highly visible case

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of fraud in South Korea. These threats are exacerbated by inflated expectations of new scientific research programs or discoveries, and by a general ignorance of the fallible nature of science and scientists.

## What Science Really Is

We often place far too much confidence in science. To state what science really is, we should first be explicit about what it is not. It is not always methodical. It is not always logical. It is not immune to individual prejudices or biases. It is not hegemonic, perfect, or immune from corruption.

The scientific method is not the same thing as science, though it is an integral part of the institution of science. The institution of science is composed of scientists utilizing the scientific method, within a framework that includes such things as the peer-review process, pedagogy, mentoring, and other social-institutional phenomena. Science is a human endeavor and, as such, is prone to bias, error, emotion, greed, hubris, and manipulation. All of these are human traits, and thus each researcher may be guilty of any of these failings. To be sure, these failings are present in every human activity and most often affect us when politicians and others more involved in our day-to-day lives than scientists fall prey to these weaknesses. Because science is largely self-correcting, these failings are usually rectified long before science's practical offshoot, technology, makes its way into our lives. Science is conducted by fallible humans, but as an institution, science weeds out human errors over time in a way that no other major self-regulating institution does.

This happens because scientists understand fully what composes their institution. To be sure, despite peer review, some fraud, corruption, and error nonetheless survive. Yet unlike political corruption, which is often addressed by circling the wagons and institutional denial, scientific fraud, corruption, and error must eventually be weeded out due to the very nature of the method of science. Science's overarching project is greater understanding, prediction, and control of the universe. Scientific theories are measured in their success by the degree to which they offer greater understanding, prediction, and control. Fraudulent, corrupt, or erroneous scientific theories cannot ultimately offer greater degrees of understanding, prediction, or control. No amount of concerted circling of the scientific wagons can overcome this basic check on the success of scientific theories.

Science really is human, sporadic, messy, not always pretty, sometimes ugly, but also the most successful means we have yet developed to understand the universe and to improve our standards of living. In sum . . . science works. But scientists, and those of us who wish to promote science as the best epistemological method there is, must be mindful of the fragility of the public's understanding and faith in science as an institution, and scientists as its instruments. We must realize that, by and large, science is still largely part of the public weal, and that scientists have a special duty to maintain the trust of the public whose beneficiaries they are.

## The Korean Stem-cell Fraud

How does a tragedy such as that perpetrated by Dr. Hwang Woo Suk in South Korea occur, and what threat does it pose to public faith in the institutions of science? William Broad and Nicholas Wade remind us of the messy and human nature of science and the long history of scientific fraud dating back at least as far as Ptolemy (Broad and Wade 1982). They note suspicious data, overly elegant results, and problems with replicability from Galileo and Newton to Mendel and Nobel Prize winner Robert Millikan. There are numerous factors that lead scientists to fudge, cheat, and defraud. Foremost among them now appears to be the pressure of academic science, mixed with financial demands for more and bigger grants. "Careerism" in science is a strong incentive for cheating. The pressure from academic departments to get results and publish, added to now by governmental pressure for state-supported science superstars like Hwang, creates seemingly high rewards and tremendous short-term gain at the expense of scientific integrity. Dr. Hwang is still in denial, blaming much of the fraud on his underlings, but the institutional pressures are undeniable. Unfortunately, with greater media attention to prominent cases of scientific fraud, and with social and cultural factors increasing distrust in scientific methodology and personalities, it is imperative that science become better at nipping fraud in the bud. How can we alleviate these pressures and help scientists to better self-police, and what can we do to help the public better understand the true nature of science?

The New York Times, on January 12, 2006, reported that:

> . . . Dr. Hwang said his team had created 101 cloned embryos by transferring nuclei of adults' body cells into human eggs, an achievement he called "still the best in the world."
>
> Hwang said things went wrong after he handed the embryos in an early stage of development to MizMedi, which has specialists in extracting stem-cell lines from fertilized eggs. When MizMedi reported to him that the hospital had also extracted stem cells from his cloned embryos, he said, "I felt my dream come true."

The fault for accepting the dubious results was Dr. Hwang's, but it was exacerbated by the South Korean government's over-exuberance in lavishing praise on the alleged results and in turning the achievement into South Korea's Apollo Mission. But the Apollo mission took a decade to achieve and was the result of thousands of individuals working together. Hwang's elevation to the status of a national hero fed the temptations of careerism and were an affront to real scientific progress and its true nature. Fortunately, due to the prominence of the case, and the media and scientific attention it garnered, discovery of the fraud was accelerated. He has since been fired from his university post.

Those of us in the West who too quickly used the case to criticize the U.S. government's failure to fund stem-cell research were ashamed of our personal failure to be appropriately skeptical. We must always remain skeptical of amazing new scientific claims. We should also promote a healthy skepticism in the methods and institutions of science in general,

SCIENCE AIN'T AN EXACT SCIENCE
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# Can Jim Berkland Predict Earthquakes?

ROGER HUNTER

Gerald Fried

Jim Berkland is a retired Santa Clara, California, county geologist who has issued earthquake predictions since 1974. He has a monthly newsletter and a Web site; Berkland was recently featured in a book by Cal Orey titled The Man Who Predicts Earthquakes (Orey 2006).

Berkland bases his prediction windows (eight-day time periods) on syzygy, the conjunction or opposition of the sun and moon, which happens once a month (each) for a total of two possible windows. It's possible to have three on occasion, since the lunar cycle is shorter than a month. When perigee occurs close to new moon or full moon it determines the primary window, the one used as a prediction for that month. Tide height at various stations (principally the Golden Gate Bridge) also may enter into the formula. Another factor can be the number of lost pets in whatever newspaper Berkland happens to consult. His final window is a hodge-podge of factors, which makes replication difficult. None of these factors are original with him, but the way he combines them may be.

## Analyzing Berkland's Data

In order to study the validity of Berkland's claims, I used searches of the earthquake catalogs of the National Earthquake Information Center (NEIC) and the Advanced National Seismic System (ANSS), both available on the Internet. The NEIC file was taken from the Centennial Catalog (Engdahl 2002) and is the best source for larger global earthquakes from 1900 to 1999. The ANSS file contains all known events for the western United States since 1900 and was chosen for its completeness (including lower magnitude levels) compared to the NEIC catalogs.

I also have compiled a list of all Berkland's newsletter predictions taken in part from copies of the newsletters and from information posted on his Web site. I believe the list to be accurate and have sent it to him for verification, but despite his repeated promises to do so he has never certified it in full. The list starts with 1974 and continues to the present. My analysis ends with 2004.

## Procedure

Evaluating the success of a prediction should be a straightforward process. You simply compare the parameters of the prediction (date, location, size) against all the earthquakes and count hits and misses. Unfortunately Berkland has made this nearly impossible by shifting the location from time to time and insisting on getting partial credit for near-misses. The best I can do is to analyze the results he would have obtained had he been consistent. His most recent parameters were used for all windows, since they should be the most accurate.

I wrote a program that compares all the earthquakes to all his predictions and counts all the hits and misses for each area and each target ring individually. These totals are compared to chance by two different methods described below.

The statistical significance of the results can be determined by comparing his results to those that would result by chance. This is best done by the z-binomial test that may be used when all predictions have the same probability. This is true for Berkland's four areas, which are the same every month. In order to meet the z-binomial restrictions I have treated each parameter group individually. I used the calculator published as part of VassarStats by Purdue University (available at http://faculty.vassar.edu/lowry/VassarStats.html).

## Prediction Parameters

Berkland predicts for four areas, three in the western United States and one global. The bullseye prediction is a 140-mile-radius circle around two particular locations in California, a blanket area covering all of Washington and Oregon, and a global prediction for anywhere on Earth. Each area has an eight-day window and a particular magnitude range.

In addition to the bullseye, he insists on three near-miss rings consisting of an added day at the beginning and end of the date range, a 10 percent increase in the radius and an additional 0.1 unit of magnitude on each end of the magnitude range.

| | Ring | Location | Radius | Mag. Range |
|---|---|---|---|---|
| Mt. Diablo | Bullseye | 37.9 N, 121.9 W | 140 miles | 3.5 to 6.5 |
| | Ring 1 | | 154 miles | 3.4 to 6.6 |
| | Ring 2 | | 168 miles | 3.3 to 6.7 |
| | Ring 3 | | 182 miles | 3.2 to 6.8 |
| Los Angeles | Bullseye | 34.0 N, 118.0 W | 140 miles | 3.5 to 6.5 |
| | Ring 1 | | 154 miles | 3.4 to 6.6 |
| | Ring 2 | | 168 miles | 3.3 to 6.7 |
| | Ring 3 | | 182 miles | 3.2 to 6.8 |
| WA-OR | Bullseye | Anywhere in the two states | | 3.0 to 5.5 |
| | Ring 1 | | | 2.9 to 5.6 |
| | Ring 2 | | | 2.8 to 5.7 |
| | Ring 3 | | | 2.7 to 5.8 |
| Global | Bullseye | Anywhere in the world | | 7.0 to 9.9 |
| | Ring 1 | | | 6.9 to 9.9 |
| | Ring 2 | | | 6.8 to 9.9 |
| | Ring 3 | | | 6.7 to 9.9 |

Table 1. Jim Berkland's earthquake prediction chart

Roger Hunter is a former employee of the U.S. Geological Survey, National Earthquake Information Center, in Golden, Colorado, where he created and ran the Earthquake Prediction Monitoring and Evaluation Program. He retired in 1995 and continues his interest in earthquake prediction evaluation.

Finally, he insists that all times be expressed in Pacific Standard Time, which is confusing to anyone looking at a list of earthquakes in Greenwich Mean Time.

Berkland's areas are seen in table 1, taken from his Web site:

## Results

Each ring of the predictions for each area was analyzed separately so that the restrictions of the z-binomial test were met. The results are listed in table 2. Any value in the significance row smaller than 0.010 can be considered significant. If the probability is smaller than the success rate, the results are better than chance. If larger, the results are worse than chance.

The results in table 2 are for simple probability, which is determined by the fraction of time covered by the windows. It tells us what percentage of the quakes should be captured by that number of days. It is strongly affected by clustering in the dataset caused by swarms (a group of related quakes unassociated with a large quake) or aftershocks. If a cluster hits a predicted window, the apparent success is boosted; if the cluster misses the windows, the success is lowered. This is exactly the case with the extremely high significance of the Los Angeles area and the extremely low significance of the Washington-Oregon areas.

In the Los Angeles area there was a swarm of earthquakes in mid-1992. 353 of these small quakes were in the June window. If they are removed from the totals the apparent significance reverses and the result becomes significantly below chance.

In the Washington-Oregon area there was a swarm of small quakes in March, April, and May 1980 that could have reversed the significance to positive had they been in windows. A similar swarm happened in 2004 and was also missed. An earlier version of this table is included in Orey's The Man Who Predicts Earthquakes.

A better estimate of actual results is obtained by using the Jones Observed Probability method, which was designed by Alan Jones (Jones 1964) to greatly reduce the effect of clustering without needing to remove the clusters from the datasets. The Jones method examines the historical catalog and determines how many windows of a given size contained one or more suitable earthquakes. Table 3 shows these results.

With this analysis, the results are much clearer. In the case of bullseye hits, 25.99 percent of them should be in windows by chance alone, but Berkland's windows had 34.13 percent hits, making him appear much better than chance. The ten-day Ring 1 does the same. But this is just a statistical anomaly because none of the other areas or rings do significantly better than chance (by the z-binomial test of significance, when, again, significance requires a value smaller than 0.010). If his method was valid, all of his results would be better than chance.

| | Global 7.0+ Quakes | Los Angeles Area | Mt. Diablo Area | Washington-Oregon Area |
|---|---|---|---|---|
| **Bullseye** | | | | |
| Probability | 20.70% | 20.70% | 20.70% | 20.70% |
| Number of quakes | 447 | 1,824 | 964 | 1,529 |
| Number of hits | 124 | 463 | 235 | 213 |
| Success rate | 27.74% | 25.38% | 24.38% | 13.93% |
| z-binomial single-tail signif. | 0.00015 | <0.000001 | 0.0027 | <0.000001 |
| **Ring 1** | | | | |
| Probability | 25.88% | 25.88% | 25.88% | 25.88% |
| Number of quakes | 559 | 2,634 | 1,555 | 1,530 |
| Number of hits | 182 | 873 | 422 | 255 |
| Success rate | 32.56% | 33.14% | 27.14% | 16.67% |
| z-binomial single-tail signif. | 0.00019 | <0.000001 | 0.136 | <0.000001 |
| **Ring 2** | | | | |
| Probability | 31.05% | 31.05% | 31.05% | 31.05% |
| Number of quakes | 689 | 3,645 | 2,776 | 1,531 |
| Number of hits | 247 | 1,294 | 877 | 304 |
| Success rate | 35.85% | 35.50% | 31.59% | 19.86% |
| z-binomial single-tail signif. | 0.0037 | <0.000001 | 0.274 | <0.000001 |
| **Ring 3** | | | | |
| Probability | 36.23% | 36.23% | 36.23% | 36.23% |
| Number of quakes | 864 | 4,847 | 4,431 | 1,532 |
| Number of hits | 358 | 1,946 | 1,524 | 351 |
| Success rate | 41.44% | 40.15% | 34.39% | 22.91% |
| z-binomial single-tail signif. | 0.00082 | <0.000001 | 0.0057 | <0.000001 |

Table 2. Summary of results—simple probability

While the current work is sufficient to establish that Berkland is not actually predicting quakes, I have attempted to find windows similar to his that work better. I have examined windows of different length and different placement with regard to syzygy. Some are better than his, some are worse, but none show significant results compared to chance.

It just doesn't work.

| | Global 7.0+ Quakes | Los Angeles Area | Mt. Diablo Area | Washington-Oregon Area |
|---|---|---|---|---|
| **Bullseye** | | | | |
| Probability | 25.99% | 42.16% | 35.73% | 31.14% |
| Number of windows | 293 | 293 | 293 | 293 |
| Number of hits | 100 | 128 | 114 | 87 |
| Success rate | 34.13% | 43.69% | 38.91% | 29.69% |
| z-binomial single-tail signif. | 0.000935 | 0.319 | 0.142 | 0.319 |
| **Ring 1** | | | | |
| Probability | 36.80% | 62.58% | 55.52% | 35.92% |
| Number of windows | 293 | 293 | 293 | 293 |
| Number of hits | 130 | 181 | 166 | 103 |
| Success rate | 44.37% | 61.77% | 56.66% | 35.15% |
| z-binomial single-tail signif. | 0.0043 | 0.413 | 0.371 | 0.417 |
| **Ring 2** | | | | |
| Probability | 49.58% | 77.75% | 77.86% | 41.31% |
| Number of windows | 293 | 293 | 293 | 293 |
| Number of hits | 160 | 226 | 231 | 118 |
| Success rate | 54.61% | 77.13% | 78.84% | 40.27% |
| z-binomial single-tail signif. | 0.048 | 0.428 | 0.371 | 0.382 |
| **Ring 3** | | | | |
| Probability | 63.54% | 91.59% | 91.47% | 46.97% |
| Number of quakes | 293 | 293 | 293 | 293 |
| Number of hits | 199 | 270 | 268 | 132 |
| Success rate | 67.92% | 92.15% | 91.47% | 45.05% |
| z-binomial single-tail signif. | 0.067 | 0.405 | 0.460 | 0.274 |

Table 3. Summary of results—Jones probability

## Note

All information used in this article can be requested from the author via e-mail at: rogerh@basicisp.net.

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## Further Information

ANSS Web site: http://quake.geo.berkeley.edu/cnss/catalog-search.html.

Jones' Berkland's Web site: http://cedarc.ldeo.columbia.edu/cgi-bin/news.cgi?id=2&option=com_frontpage&/Itemid=1

NEIC Web site: http://neic.usgs.gov/neis/epic/epic.html.



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so that the public knows not to expect too much from scientists.

Finally, we need to encourage and promote more ethical behavior among scientists, even as we hold them to more human standards. While we cannot expect them to be superhuman, we should expect them to be capable of good moral judgment, and to put the truth above their own interests. There should be better self-regulation in science. There is every reason to think that future high-profile failures, frauds, cheats, or lies could continue to undermine the system and be used by the enemies of science to ensure that its basic assumptions, and the underlying methodology of scientific naturalism, are undone. We need to prevent this possibility, through realism and pragmatism, and of course, good basic-research ethics.

## Ethics as Part of the Methodology of the Sciences

Scientists should not be held by the public to an unreasonably high standard, and we who are promoters of science must not encourage a godlike view of scientists or their achievements. On the other hand, part of the proper methodology of science in its ideal form includes some ethical principles. Among them are "equipoise" (see my article, The Ethics of Investigation," SKEPTICAL INQUIRER, January/February 2006) and fidelity. Fidelity, or truth telling, is perhaps the most fundamental ethical principle that is inextricable from the methodology of science itself. The purpose of science is itself truth. Hypotheses and theories are only valuable for the aims of understanding, prediction, and control if they are substantiated by evidence. Experimental verification, or falsification, are the only means we have of tying hypotheses and theories to the evidence. Scientists cannot therefore manipulate data to support theories they aesthetically like, or that promise personal glory or career advancement. Rather, they must accept dispassionately the evidence that derives from testing. They must remain dispassionate and report the truth.

The object of truth is inherent in the subject of science itself. Although it is an ongoing process, and ultimate truths are only approached and never proven, they come to be verified and accepted over time through mounting evidence. Scientists understand this concept, and must incorporate it into their behaviors not just as a necessary component of the methodology and institutions of science but as an ethical precept as well that guides their individual relation to the data they gather and report.

The future of the public perception of science is at stake, and together with scientists, we must encourage a better general understanding and appreciation of its methods, as well as greater institutional and personal appreciation of research ethics within the sciences and among scientists.

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# Name Dropping

## Want to Be a Star?

PHILIP PLAIT

> But above and beyond there's still one name left over
> And that is the name that you never will guess
> The name that no human research can discover
> But the cat himself knows and will never confess.
>
> —T.S. Elliot, "The Naming of Cats"

In the late fall, the constellation Andromeda looms high above the horizon. It's not a terribly bright constellation: the stars are faint enough that even low lights from a nearby town or city can wash them out.

But in ancient times, when light pollution was lower, those stars shone brightly over the Middle East, and astronomers carefully named them. The stars of Andromeda still bear the nomenclature of their arabic origins: Almach (a wild cat), Mirach (probably a rendition of Mizar, the loin, distorted over the centuries), and Alpheratz (the horse's navel, of all things).

There are thousands of stars in Andromeda, of course. Most are too faint to have names and instead have catalog numbers, such as SAO 54033, or GSC 2261, or the poetic HIP 7607 (which, unfortunately, has nothing to do with the hip, unlike Mizar). But there is another star in Andromeda, not nearly so bright as Almach or Mirach, even fainter than many of its brethren that boast only serial designations. It's so faint that you'd need a hefty pair of binoculars or a telescope to see it, and even if you did, you'd probably pass right over it, so ordinary is its glow. Yet it has a name, a full-blown proper name. You might recognize it: the star is named Philip Cary Plait.

How I got that name isn't terribly interesting (a family tradition to name babies after recently departed loved ones is the culprit), but how the star got that name is a different story altogether. It's a tale of morally shady dealings, outrage, and sadness. But most of all, it's plain old bad astronomy.

## So Many as the Stars of the Sky in Multitude

What's in a name? A star, by any other word, would fuse as hot—if only Shakespeare had been an astronomer. But giving things names is so natural to humans. When my daughter was only four years old, she wanted to know the names of everything: types of rocks, insects, trees, even stars. I would tell her what was what (quartz, or praying mantis, or dogwood, or Vega), and she would solemnly repeat it, seemingly committing it to memory. But within a few seconds, we were off to some other phylum of study, the name already forgotten.

Back in the days of CB radio, your name was called your "handle," a code word I always liked. Names are like handles, letting us grip an object. A name can help you classify an object or understand it better. And really, a name is a way of distinguishing one thing from a thousand others just like it.

The ancient astronomers saw the stars as making patterns in the sky, the constellations. The names they gave the stars were generally associated with the pattern. So the brightest star in Cygnus, the swan, became Deneb, meaning tail. Arcturus means "bear watcher," appropriate enough for a bright star that appears to follow Ursa Major, the Big Bear, around the celestial pole. My favorite of all are Libra's Zubeneschamali and Zubenelgenubi, respectively, the northern and southern claws, names given before Libra was split off from Scorpius, the scorpion.

But these are bright stars, of which there are only a few. It's not hard to imagine astronomers in ancient Greece and Arabia scratching their heads over what to do with fainter stars. The unaided eye can see thousands of stars on a clear night, and that's quite a brood. The astronomer Bayer simply gave them Greek letters in order of their brightness in a constellation (saddling us with things like Upsilon Coronae Borealis and Epsilon Ursae Majoris).

But even those names run out soon enough, and with the invention of the telescope, things got out of hand. The great cataloguer Flamsteed used numbers, ordering the stars in a constellation from east to west. In the nineteenth century, German astronomers created the Bonner Durchmusterung catalog, using stars' coordinates (a celestial version of latitude and longitude) to designate them.

After a while, catalogs started getting more specific, so there were lists of double stars, lists of variable stars, lists of red stars, lists of magnetically peculiar stars, lists of stars with an unusual amount of carbon in their spectra. Astronomy, arguably the most beautiful and poetic of the sciences, was becoming laden with a very heavy dose of prosaicness. Of course, there are something like 200 billion stars in the Milky Way galaxy. What else can astronomers do?

In reality, astronomers can't do all that much. But where science sees a dead end, the free market sees an opportunity.

## That Worthy Name by Which Ye Are Called

Enter the International Star Registry (ISR). In the early 1980s, they saw that there's gold in them thar points of light. They figured, with all those stars in the sky, why not sell people the right to name them? So they set up shop. Send them $50 and the name you want to give a star, and in return, they send you a kit that contains an artistically decorated certificate with the star name and coordinates, a small map with the position of the star on it, and a note saying that this is now the official name of the star. They added that "your" star name will be registered in a book that will be placed in a Swiss vault and also registered with the Library of Congress.

Sounds pretty cool, right? Well, there's a problem with

Phil Plait works in the physics and astronomy department at Sonoma State University in California. He maintains the Web site badastronomy.com. His book Bad Astronomy (Wiley & Sons 2002) reveals misconceptions and misuses of astronomy.

it. Not a problem for the ISR, certainly, since they claim to have sold hundreds of thousands of stars at that price, so they're doing pretty well. The problem—or actually, problems—is that it's not much more than a scam.

For one thing, getting something into the Library of Congress isn't all that hard. They acquire something like 7,000 items every day! According to the Library's Web site, items are acquired "Through exchange with libraries in this country and abroad, gifts, materials received from local, state and federal agencies as well as foreign governments, purchase, and copyright deposits." With 530 miles of shelves in the Library, there's room for lots of things that maybe aren't all that special. So claiming that getting the catalog into the Library of Congress makes it special is a little deceptive.

Turns out, Switzerland wasn't all that thrilled with having its name used in the ISR ads—the ISR had neglected to ask permission first from the Swiss government to use their country in the ads. Given Switzerland's almost pathological history of neutrality, such a statement by them is a pretty strong indication you've done something wrong. Anyway, the claim of storing the catalogs in a Swiss vault is simply silly. For a set fee, you can get space in such a vault and put whatever you want in there: a deck of cards, that key on your key ring that doesn't seem to fit any locks, an unmatched sock, that awful candy dish your mother-in-law gave you on your last birthday, what have you.

A third problem is that the name you give the star is in no way official. In fact, there's no real official name for any star in the sky. There are names that astronomers use, names they agree upon, but even then, things are a bit fuzzy. The brightest star in the sky has the name Sirius. But it's also called Alpha Canis Majoris, 9 Canis Majoris, HR 2491, HD 48915, and BD-16 1591. Any and all of these are equally good names for it, and which one you use depends on what you're doing. At a star party, you'd use Sirius, but if you're studying X-rays emitted from the star, you'd call it RX J0645.1-1642. Infrared astronomers might call it IRAS 06429-1639. Bad science fiction authors call it the Dog Star.

It's much the same as how you might address a person depending on the circumstances: John if you're a friend, Mr. Smith if it's formal, John Smith if it's a letter, or Mr. J0hn Sm1th if you're sending him spam.

As a final piece of silliness, some astronomers told me that they looked into the stars sold by the ISR and discovered that in some cases, the same star has been sold multiple times to different people. 200 billion stars in the galaxy, and the ISR had to resell the same few over and over again.

## That Was the Name Thereof

There is a group of astronomers who keep track of all this. They are the International Astronomical Union Commission 5, an appropriate handle for the Keepers of the Names. Basically, they lay out a set of rules to use when something in the sky gets named. Asteroids, for example, need to have well-determined orbits first. Then they are given a number, and then the discoverer can propose a name, which they must defend. Then, sometimes months or even years later, the asteroid gets that name, unless it's rejected for some reason.

IAU Commission 5 has, on its Web page (http://cdsweb.u-strasbg.fr/iau-spec.html) rules for naming just about everything . . . except, apparently, stars. They do list how to name something using coordinates, what symbols you can use (for example, slashes, dashes, and underscores are allowed, though, oddly, not the degree sign), and so on. But they don't say anything explicit about paying money and giving a star the name of your poodle. Since it's not specifically ruled out, I suppose you could argue that it's allowed.

Incidentally, the IAU does have a Web site (www.iau.org/BUYING_STAR_NAMES.244.0.html) about star-naming companies, and it has a clear ring of distaste running through it (it refers to the practice as "charlatanry"). So their position on this issue is pretty clear.

So, if you are running a star-naming company, you cannot state that the name given to a star is "official," since there are no real official names for stars. Saying that implies, strongly, that astronomers will use your name for a star instead of whatever designation it already has. Even if this isn't outright wrong, it's at the very least misleading.

The New York Office of Consumer Affairs certainly felt this way. It levied an injunction against the ISR for using deceptive advertising in New York City, and the ISR was found guilty on multiple counts, with fines up to $3,500 (a tiny fraction, of course, of the company's income). The Federal Trade Commission weighed in, forbidding the ISR from using the Library of Congress in its ads too. This small road block hasn't even slowed down the ISR. It still advertises, mostly around Christmas (though the ads no longer mention the Library of Congress).

Many people ask, understandably, what harm does this cause? Who cares if people are making money by selling star names? After all, caveat emptor. But, it turns out that there is a nasty side to this business.

## Purpose Under the Heavens

Many stars are "bought" from the ISR as gifts to friends and family, of course. But a great number of them are purchased as memorials, a tribute to a loved one who has died. This is a sad and beautiful thought, to be able to commemorate a lost relative with a star in the sky.

But the star isn't really named after that person, and certainly no astronomer uses that name for the star. Again, this wouldn't normally be a problem (as long as such deception is okay by you), except that there are times when the people involved go to an observatory and ask to see the star named after their dead son or daughter.

Imagine being an astronomer during an observatory's public night, happily showing people the wonders of the universe through the telescope, then having someone

ask you to see the star they named after their daughter who died tragically. They only have the name they gave it, not the position or any other name that might be useful. Worse, they really, honestly think that every astronomer has access to the ISR and can easily find their star. Having run many a public night myself, I can only imagine how horrible I would feel. In such cases, what do you do, tell the people they were lied to, or deceived, crushing them? Or do you keep quiet, spare their raw feelings, and perpetuate the lie by showing them some random star?

Many astronomers don't have to imagine this. It's happened to them. One astronomer, Bob Martino, the assistant director of the Perkins Observatory at Ohio Wesleyan University, has had this happen to him at least four times. At first, he learned to swallow his anger and simply point the telescope. Finally though, he couldn't take it quietly any more. He put up a Web page railing against the idea of selling stars. He said the practice was fraudulent, a scam (after all, the ISR was found guilty of misleading advertising in New York City). He was pretty clear about how he felt.

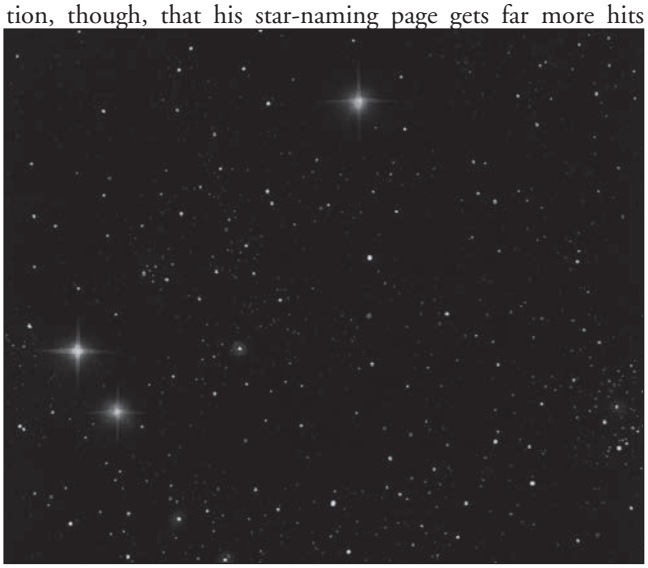
In the year 2000, the ISR retaliated. Their legal arm threatened to sue the university, the observatory, its director, and Martino. The ISR, backed by a lot of money, put quite a bit of legal pressure on the planetarium, which did not have a lot of money. Martino took his page down, though he was unhappy about it. Nothing Martino said about the ISR was untrue, just unflattering.

It's interesting to note that the ISR was never directly indicated anywhere on Martino's page. There was a link at the bottom of the page about the New York City case, which mentioned the ISR, but that was it. Even that was too much for the ISR, which again contacted the university, insisting that the Web site could not talk about star naming at all. From a baseless case of slander, the situation was quickly turning into one of First Amendment rights. As Martino put it, it was ". . . a case of a consumer advocate being muzzled by a company of extremely questionable moral integrity." After this event, several astronomers who had Web pages about star-naming companies edited their pages, carefully and prominently mentioning the First Amendment. Some sites even linked to a copy of the Constitution.

For his part, Martino kept up the fight. He made his opinion clear on the Internet through various mailing lists and bulletin boards. The ISR once again contacted his university, stating that the company wanted Martino to cease talking about it, claiming that Martino was representing himself as a spokesman for the university. This claim, Martino says, has "no basis whatsoever." He says his comments were made on his own time, using his private Internet account through his own Internet provider, and the university had nothing to do with it. Still, the university was being pressured by the ISR's legal arm, so they sent Martino a letter making it clear that he'd better stop talking about the ISR. Martino wound up moving the whole page about star naming to a private Web site, which is mirrored in many places (for example, at www.enzerink.net/peter/astronomy/starfaq/).

Martino is still pretty ticked about all this. As he put it, "A small company operating a business based on deception can squelch free speech rights at a university merely by having a lawyer send a letter." It also doesn't help him to remember those grieving people to whom he had to lie.

Martino does extract some small amount of satisfaction, though, that his star-naming page gets far more hits



than it did before the ISR threatened him. Evidently, the publicity woke up other astronomers to this, and they now link their sites to his page as well.

I'll note that Martino has a daughter, named Celeste: she is named after the stars, and not the other way around.

## Their Starry Host

And what of "my" star, Philip Cary Plait? It's a dim bulb, a tenth-magnitude speck, lost among thousands of others. I couldn't find it with binoculars if I tried. My brothers got it for me for my birthday many years ago—yes, from the ISR. I was curious about it when I was first researching this topic, so I called the ISR and asked them about it. It turns out that this was one of the first stars they "sold," and they had to go to their first catalog to find it. They couldn't give me the exact position, but the information I got was good enough that I was able to figure it which star it was. Here's an image of it:

Can you spot it? It's the one dead center. The field of view of the image is roughly a degree across, twice the width of the full moon. Look at all those stars! Some people say that studying astronomy makes them feel insignificant. I actually have proof of it.

The final humiliation is that "my" star, of course, already has a name—BD+48 683. It's been listed for over a century in the German Bonner Durchmusterung catalog used by practically every astronomer on the planet. Now that's an

# Why What We Know Isn't Necessarily So

PETER LAMAL

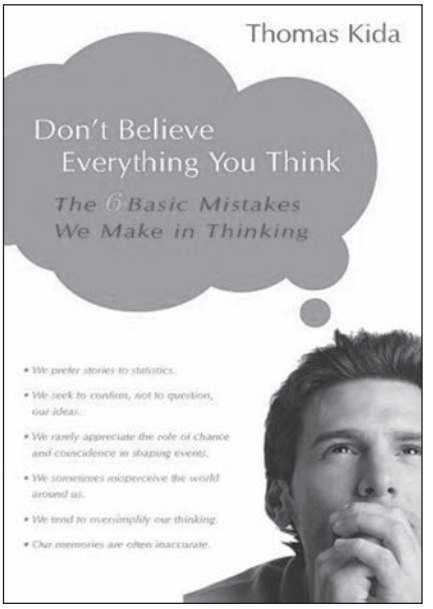
Don't Believe Everything You Think: The 6 Basic Mistakes We Make in Thinking. By Thomas Kida. Prometheus Books, Amherst, New York, 2006. ISBN 1-59102-408-0. 286 pp. Paperback, $19.

In Don't Believe Everything You Think, Thomas Kida describes the main ways by which we arrive at false beliefs, which in turn lead us to make decisions that are harmful not only to ourselves but to society. Concerning the latter, for example, public officials spent around $10 billion in the 1990s to eliminate asbestos from public buildings. Asbestos may be dangerous if inhaled, but its wholesale removal from buildings was based on the erroneous belief that its mere presence in building materials was in every case a serious health hazard. In fact, however, its removal is often more dangerous than leaving it in place.

The importance of critical thinking is one of the main topics of former Harvard President Derek Bok's recent book Our Underachieving Colleges. And most of the content of Levitt and Dubner's wildly popular Freakonomics is the result of the authors' critical thinking about various contemporary topics. But, says Kida, critical thinking and decision-making are typically not taught in our schools.

Kida's book is a primer to help us avoid obstacles to critical thinking and decision-making. Kida presents us with what he labels "our six pack of problems." The first problem is that

Peter Lamal is emeritus professor of psychology at the University of North Carolina–Charlotte and a Fellow of the Division of Behavior Analysis of the American Psychological Association.


Thomas Kida
Don't Believe Everything You Think
The 6 Basic Mistakes We Make in Thinking
• We prefer stories to statistics.
• We seek to confirm, not to question, our ideas.
• We rarely appreciate the role of chance and coincidence in shaping events.
• We sometimes misperceive the world around us.
• We tend to oversimplify our thinking.
• Our memories are often inaccurate.

we prefer stories to statistics. But relying on anecdotal evidence to form our beliefs and make our decisions can result in serious errors because we ignore other relevant information. Much of this other information is statistical. The problem is exacerbated by the news media's reliance on anecdotal evidence. The news media often present us with gripping personal stories without addressing whether they are representative of many other individuals.

Another problem is that we seek to confirm—not question—our ideas (psychology's "confirmation bias"). We look for, and remember better, information that supports our beliefs while we ignore or discount information that would undermine or contradict our beliefs.

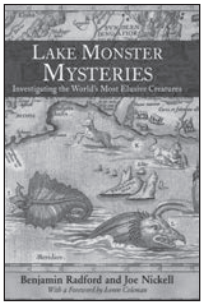
We also rarely appreciate the role of chance and coincidence in life. We often believe that we see causes for events that are in fact random, or simply the result of chance occurrences.

Erroneous beliefs are sometimes caused by misperceptions of our world. What we see is not always an accurate record of external reality. Our perceptions are strongly influenced by what we expect (and want) to see and hear.

Sometimes the amount of information confronting us is overwhelming, so we use a number of simplifying strategies. Such strategies can save us time and effort and enable us to make decisions quickly. But if we oversimplify and ignore important information, we can make costly inaccurate judgments.

Human memory is far from a permanent record of our past experiences. Not only do our memories change over time, we can create new memories for events that never actually happened. Our current beliefs, expectations, and suggestive questioning can strongly influence our memories of past events. In light of this it's more accurate to think of memory as a reconstruction of the past.

Unfortunately, Kida notes, we are typically not even aware that these basic mistakes in thinking exist. In addition to the six pack of problems, Kida briefly considers such issues as 20/20 hindsight, intuitive judgments, and the influence of others, including groupthink.




# Plunging into the Depths of a Mystery

MICHAEL DENNETT

Lake Monster Mysteries: Investigating the World's Most Elusive Creatures. By Benjamin Radford and Joe Nickell. Lexington, Kentucky, The University Press of Kentucky, 2006. ISBN 0-8131-2394-1. 190 pp. Hardcover, $24.95.

Lake Champlain is home to Champ, the most famous American lake-monster legend. Forming part of the boundary between Vermont and New York State, the majestic lake has been the source of tales, if reports are accurate, since the earliest point of exploration. According to popular accounts, Samuel de Champlain reported seeing the monster in July 1609. It probably will not come as a surprise to readers of this magazine, but the actual account by Champlain, as reported in this terrific new book by Radford and Nickell, is much more mundane. Champlain's actual description, from volume 2 of his journal, is of seeing "a great abundance of many species of fish . . . the largest of them . . . I have seen [is] some five feet long . . . and had a head as large as my two fists, with a snout two feet and a half long, and a double row of very sharp, dangerous teeth." So no monster after all!

**Radford and Nickell take the high road, assuming the witnesses to be essentially honest in their accounts. Their approach is respectful of the believers.**

Michael Dennett has reported on sightings of alligators in Seattle, alleged dinosaurs in the Congo, and an abominable photograph of the Yeti. His most recent article for the SKEPTICAL INQUIRER concerned the legend of Bigfoot and appeared in the January/February 2005 issue.

Although some of the text in Lake Monster Mysteries is devoted to revelations like the one above, most of the book consists of field investigations by the authors. The locations of these on-site inquiries include Lake Champlain and, on the other side of the continent in British Columbia, Lake Okanagan, the home of Ogopogo. Vermont's other lake monster, Memphre, is on the list, as is that of Lake Crescent in northeastern Newfoundland. In all of these cases, the authors detail their successful efforts to provide sensible explanations to the various sightings and reports.

There are an amazing number of lakes with stories of unusual creatures (possibly as many as 300 globally), too many for even these intrepid researchers to tackle. Instead, they have produced a compact review of the most impressive cases, including an excellent account in chapter one of the diminishing case for a monster in Scotland's Loch Ness. The end result, I feel, is a concise appraisal (the book is only 190 pages, including appendices and the index) of this off-beat part of the field of cryptozoology. There can be little doubt after reading this book that there are many mechanisms, both natural and psychological, sufficient to create monster legends without the need for a physical creature.

Of special interest to skeptics should be chapter four on the Silver Lake (New York) monster hoax. Known almost from its beginnings as an example of how a lake monster could be faked, the authors reexamine this unusual tale. They come to a surprising and illuminating conclusion.

In the process of interviewing witnesses and examining various historic accounts, both Radford and Nickell take the high road, assuming the witnesses to be essentially honest in their accounts. Their approach is respectful of the believers. This in no way diminishes, but rather enhances, their investigative method. In the end, the authors' case against a physical creature for each of the legends is monstrously strong.

Lake Monster Mysteries has many photographs, is well illustrated with maps and drawings, and is supplemented by four excellent appendices. Attention to detail is evident throughout. I was particularly impressed with the effort put into appendix 3, which shows one possible (and plausible) explanation for the famous Mansi photo of Champ.

Long-time SKEPTICAL INQUIRER subscribers will find that some of the

# H.P. Lovecraft and 'Extraterrestrial Genesis'

PAT HARRIGAN

The Cult of Alien Gods: H.P. Lovecraft and Extraterrestrial Pop Culture. By Jason Colavito. Prometheus Books, Amherst, New York, 2005. ISBN 1-59102-352-1. 380 pp. Paperback, $19.

The ostensible thesis of Jason Colavito's The Cult of Alien Gods is that modern pseudoscientific notions of "extraterrestrial genesis" and "ancient astronauts" have grown out of the fiction of Rhode Island weird-fiction writer H.P. Lovecraft (1890–1937). The book's wider point is more ambitious: "[This book] is also the chronicle of a unique moment in the cultural decline of the West. It is nothing less than an account of how the five-hundred-year advance of science and progress faltered and failed, and with this epic failure came the demise of the Western rationalist idea itself."

Fortunately, these jeremiads are window dressing, and can be safely ignored. Most of the book is an entertaining survey of the last thirty-odd years of pop-extraterrestrial highlights. Colavito covers the development of the ancient-astronaut, alternative-archaeology, and extraterrestrial-genesis pseudosciences, discussing Erich von Däniken, Robert Temple, Robert Bauval, Graham Hancock, Zecharia Sitchin, etc.—up to the Heaven's Gate cult and the Raëlians. This is all fascinating stuff, not least because some of the major figures in the field (Temple and Hancock specifically) were once respected scholars, before they started writing books about amphibian space gods and ancient Martian civilizations.

The Lovecraft connection itself is pretty thin. The primary point of contact seems to be a book called Les matin des magiciens (Morning of the Magicians) (1963) by French authors Louis Pauwles and Jacques Bergier. Colavito describes the book in such a way as to make it seem like a po-faced precursor to the Illuminatus! trilogy, which perhaps it is: "From Lovecraft, Bergier and Pauwles borrowed the one thought that would be of more importance than any other in their book. As we have seen, Morning of the Magicians speculates that extraterrestrial beings may be responsible for the rise of the human race and the development of its culture, a theme Lovecraft invented."

This overstates the case. Nowhere in Lovecraft's fiction does he explore the idea that extraterrestrials developed human culture. This would be a surprising thing to find in Lovecraft, in fact, since the alien entities in his stories are supremely indifferent to humanity as a whole, if not actually malign.

The Mi-Go, in "The Whisperer in Darkness," though highly intelligent, are essentially parasitical, stripping metals from the earth and occasionally stealing the brains of humans. The extratemporal Great Race of Yith ("The Shadow Out of Time") study human culture, as they do pre- and post-human cultures, but by no means assist in its creation. And the story in which Colavito grounds his primary thesis, "The Call of Cthulhu," outlines a conspiratorial cult that worships the prehistoric alien Cthulhu, "high priest of the Great Old Ones," an extraterrestrial race so far removed from humanity that the very sight of one can drive men mad.

Colavito does supply two excellent, concise chapters detailing Lovecraft's life and the (largely posthumous) spread of his "mythos," though some elements of biographical detail receive unusual emphases, such as the following passages: "H.P. Lovecraft was often poor and throughout his life had to scrimp to manage the lifestyle he thought a gentleman of his social class deserved." (Lovecraft did exhibit a routine, shabby snobbery, but it was appalling poverty that forced him to "scrimp," not aristocratic pride.) "After a brief period of dressing up like an Arab and claiming to be a Mohammedan named Abdul Alhazred, he gave up his quest for a religious life." (Nowhere does Colavito mention that Lovecraft was five years old when he did this, and the reader is left with a somewhat freakish impression of the man.)

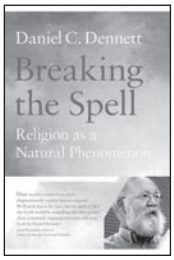
But these are quibbles. Lovecraft has been routinely misunderstood and mischaracterized, and Colavito performs a valuable service here by disambiguating the subtle mixture of cosmic pessimism and conservative Romantic nostalgia that form the twin axes of Lovecraft's thought and work. It's encouraging that Lovecraft receives such a clear-headed analysis here.

Colavito himself is a self-acknowledged alternative-archaeology apostate, and the tone of this book is an endearing mix of stridency and affection:

> Thus [Gods of the New Millennium author Alan] Alford plays numbers games and makes many other arguments derived from "creation science" literature, but at this point we see how his thinking goes. It should not surprise us then that he finishes his essay by claiming, "Clearly everything is not 'hunky dory' with Darwinism."
>
> But I do not mean to be overly harsh toward Alan Alford, no matter how vociferously I disagree with

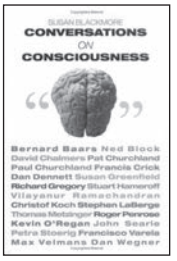
Pat Harrigan is the coeditor of the MIT Press anthologies First Person: New Media as Story, Performance, and Game (2004) and Second Person: Role-Playing and Story in Games and Playable Media (forthcoming in 2006) and the author of the novel Lost Clusters. He lives in Minneapolis. E-mail: Pat_Harrigan@yahoo.com.

Listing does not preclude future review.

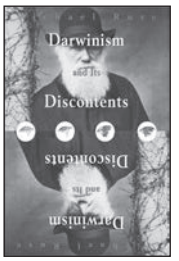



***Breaking the Spell: Religion as a Natural Phenomenon*. Daniel C. Dennett**. Viking Penguin, New York, 2006. 448 pp. Hardcover, $25.95. A prominent philosopher's exploration of the role that religious beliefs play in our lives, our interactions, and our country. The book is unapologetically addressed to American readers, and (unlike Dennett's previous books) to conscientious citizens (believers and nonbelievers alike), not just academics. Dennett notes that America is strikingly different from other First World countries in its attitudes toward religion and says his book is, among other things, a sounding device intended to measure the depths of those differences. He seeks to uncover the origins of this religious impulse that means so much to so many. Among issues discussed are how it is that people tend to think that their own religion is a unique path to truth, and how religions have developed a systematic invulnerability to disproof. Dennett argues that this veneer of mystery needs to be removed so that religions can be better understood and so that the assumption that they are necessary foundations for morality can be reexamined.

***Conversations on Consciousness: What the Best Minds Think About the Brain, Free Will, and What It Means to Be Human*. Susan Blackmore.** Oxford University Press, New York, 2006. 274 pp. Hardcover, $23. Susan Blackmore, the lively psychologist and consciousness researcher, here interviews twenty-two eminent neuroscientists and philosophers who have devoted much of their lives to understanding our brains. The central issue is consciousness—starting with what makes the problem of consciousness special, specifically, how physical processes in the brain can give rise to subjective experiences—but the interviews delve into related matters such as what drew each researcher into this field of inquiry, whether there is a distinction between conscious and unconscious brain processes, and the question of free will. David Chalmers, Paul and Patricia Churchland, Francis Crick, Daniel Dennett, Richard Gregory, Roger Penrose, John Searle, and Francisco Varela are among the participants. The interviews are enlivened by Blackmore's personality and knowledge, but she says they leave her with no sure answers to the central question.




***Darwinism and Its Discontents*. Michael Ruse.** Cambridge University Press, New York, 2006. 308 pp. Hardcover, $30. Ruse, one of the world's leading authorities on the history and philosophy of evolutionary theory, here provides an ardent defense of Darwin's theory of evolution against its many critics. He examines important issues such as the origins of life, the fossil record, the mechanism of natural selection, punctuated equilibrium, and even discusses how the recent discovery of "hobbit" people (Homo floresiensis) on an Indonesian island fits into the evolutionary context. He also discusses fraud in biological sciences, literary approaches to evolution, and the philosophical and religious implications of Darwinism.




***Imaginary Weapons: A Journey Through the Pentagon's Scientific Underworld*. Sharon Weinberger.** Nation Books/Avalon, New York, 2006. 276 pp. Hardcover, $24. A reporter on national security and defense technology (and editor of Defense Technology International) focuses her investigative tools on the bizarre scientific underworld of the Defense Department, where wild ideas and fringe science flourish in a nonpeer-reviewed world that mixes brilliance with eccentricity, or as she puts it "that fuzzy line between military science and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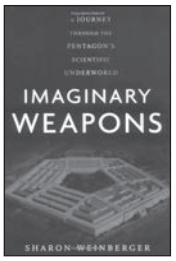
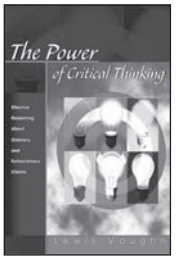


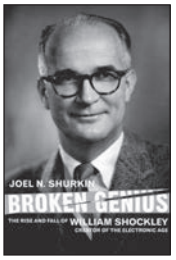

official foolishness." Her main target is the theoretical so-called hafnium bomb, a handheld "isomer" weapon that proponents contended could have the power approaching a nuclear weapon (an advisory panel called it impossible). She tells the story of a used dental X-ray machine, a few die-hard supporters, and some "far-fetched claims of a new arms race" that led to at least initial support of the hafnium bomb concept. Along the way she encounters cold fusion supporters, zero-point energy proponents, claims of psychics being able to locate foreign threats, and other such fringe science activities and "imaginary weapons." She finds there "isn't one great division between mainstream and fringe science, but rather, degrees of variation that blur, and sometimes overlap with one another." The starting point, she says, is a "willingness to believe the impossible," which in moderation is not bad but in the extreme "is a recipe for disaster."

***The Power of Critical Thinking: Effective Reasoning About Ordinary and Extraordinary Claims*. By Lewis Vaughn.** Oxford University Press, New York, 2006. ISBN 0-19-516142-4. 502 pp. Softcover, $64.95. It is no secret that the education system often fails to truly educate. Yes, students learn facts and figures, memorize formulas and equations, but all too often students do not learn the fundamentals of critical thinking. With The Power of Critical Thinking, Lewis Vaughn, co-author of How to Think About Weird Things (and former editor of Free Inquiry magazine), has provided a new book that will help educators do just that. Chapters include Making Sense of Arguments; Reasons for Belief and Doubt;




Faulty Reasoning; Inductive and Deductive Reasoning; Judging Scientific Theories; and Judging Moral Arguments and Theories. The Power of Critical Thinking provides hundreds of real-world examples to analyze, including moon landing "hoax" theories, biased news coverage, ghosts, psychics, and alien abductions. The book is remarkably complete, covering everything from debate and argumentation to a discussion of how biased wording can skew poll results. The book is designed as a teaching tool, and each chapter concludes with a summary, exercises, a self-assessment quiz, and writing assignments to make sure the principles were learned. Loaded with both Venn diagrams and cartoons, this book is suitable for high school and college students; for an excellent primer aimed at a younger audience, one of the best is Diane Swanson's Nibbling on Einstein's Brain. (Review note by Benjamin Radford)

***Broken Genius: The Rise and Fall of William Shockley, Creator of the Electronic Age*. Joel N. Shurkin.** Palgraave MacMillan, New York, 2006. 297 pp. Hardcover, $27.95. William Shockley won the Nobel Prize for co-inventing the transistor (with Walter Bardeen and Walter Brattain), but instead of becoming one of the richest, most influential, and respected men of his time, died in disgrace, virtually alone. As author Shurkin says, "Few [scientists] have gone to the length Bill Shockley did to earn the opprobrium of his peers or the public." Shockley's campaigning about race, intelligence, and genetics resulted in his donating to the Nobel Prize sperm bank and being shunned and vilified. Combining that with his irascible personality, his reputation was ultimately destroyed. Shurkin, a science journalist long associated with Stanford University where Shockley was a tenured professor,




draws upon access to the colossal private Shockley archives (Shockley's family never threw anything out) in this informed and candid biography that asks, "Why did a man so brilliant deliberately destroy himself?"

***Sex, Drugs, and DNA: Science's Taboos Confronted*. Michael Stebbins.** Palgrave Macmillan, New York, 2006. 350 pp. $24.95, Hardcover. This book is by a scientist who's not just irreverent but angry. He's upset, undoubtedly legitimately, about "miscreants and bent backs that deliberately try to confuse the public about science and have attacked scientists to move social or political agendas to go against the best information we have." He's direct, blunt, and cuts through nonsense with his scythe-like tongue: "This is not a scholarly tome. There are no references, interviews, or balanced arguments," he begins. The book "came from my perception of a need to address the litany of bullshit and lies spewed at the public." He begins with the pressures that go into making a typical modern biologist. He then takes on those who oppose stem cell research, the latest examples of those who "wear their religion on their sleeve [and] have a problem with science," a line that began with the persecution of Galileo and continues in modern times with opposition to organ

transplants, blood transfusions, recombinant DNA technology, and now stem cells. He goes on to sex education, gender differences, "race and other discriminations," genetically modified foods (and everything), global warming, bioterrorism, drugs, health care, and science education, including creationism.

—Kendrick Frazier

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# Tell It Like It Was

SUSAN BURY

Some years ago, I attended a lecture by Jared Diamond at the National Academy of Sciences (now National Academies) in Washington, D.C. He was making a point about evolution and took a moment to explain that he was going to take a shortcut in his language. Rather than go through the full explanation of how beneficial characteristics helped species reproduce and thereby became more widespread in the population, he would simply say "this characteristic evolved" to do whatever it did.

Fair enough, I thought, as the auditorium seats weren't all that comfy and I'd just as soon he got to his points more quickly. But to this day, that comment has bothered me. It bothers me every time a writer or speaker states that a characteristic "evolved to" do something or other, because it's a shortcut that undercuts a key point: evolution has no direction.

Here's a sentence from my regional newspaper, the Billings Gazette, about the pallid sturgeon, an ancient species that is disappearing from Montana's rivers: "Some scientists think that large body size evolved to help pallids make very long distance spawning migrations in free-flowing rivers." But body size didn't evolve, in the sense of evolve as an active verb, and certainly not to "help pallids." Fish that happened to be bigger were more successful in spawning migrations, thereby passing along the genes for bigness.

Susan Bury is a science writer in Red Lodge, Montana.

A New York Times story about sleep research said a leading scientist "believes that [sleep] originally evolved as a way to allow neurons to recover from a hard day of learning." But sleep was not a deliberate force, nor was there some entity out there that decided those hardworking neurons needed some shut-eye. Instead, primordial whatnots that experienced rest or sleep got benefits from it, they were successful in reproducing (they weren't asleep all the time), and sleep became widespread.

When we use evolve as an active verb, it requires a subject, as we all learned in fifth grade that active verbs do. When we say some characteristic "evolved to" do something or other, that suggests purpose. I have to wonder if writing like this reinforces in people's minds, even subconsciously, that evolution has purpose or is somehow driven. Isn't that the very point we're trying to overcome?

Here's another example from The New York Times, in which writer Natalie Angier is describing two unrelated groups of frogs, both of which eat ants that contain toxic alkaloids (okay, so maybe my bedtime reading is a little unusual): "And once the [frogs] had succeeded in caching the ant bane in their glands, they autonomously evolved bright coloration to broadcast to potential frog-eaters their possession of distasteful alkaloids."

Consider the implications of those word choices. The frogs "succeeded," which suggests they were trying to find a way to cache the stuff. Was this an example of frog "strategery," as President Bush might say? Or did a genetic twitch result in some frogs' bodies safely caching the ant bane and thereby surviving to pass the trait along? As for the frogs evolving color to broadcast their status, any reader would know they didn't start drawing on themselves with magic markers. But might a reader get a whiff of purpose or direction from the phrase "autonomously evolved"?

Using terms that suggest, even metaphorically, that a species took action on its own behalf to evolve makes it sound like a winner on TV's Survivor, consciously striving rather than simply inheriting the right genes for the circumstances. These frogs' road to success was paved with the corpses of frogs that weren't so fortunate genetically, ate the ants, and, well, croaked. I found evolution much easier to understand when I started picturing the countless species that died out, not because they fell down on the job, but because their genetic package didn't suit the time and place.

It's not hard to find examples in outlets such as USA Today that are read by a lot of people and could subtly shape their attitudes toward evolution. I found an example even in the pages of (gasp) SKEPTICAL INQUIRER. Howard Gabennesch said in his very fine article on critical thinking ". . . shibboleths derive their power from the fact that humans are designed to be social animals more than truth-seeking ones." You know what he means, and I know what he means, but for a reader who's not

familiar with the mechanisms of evolution, might this language contribute to an underlying sense that there is a designer?

Finally, there's this from a researcher who studies mate selection, writing in New Scientist about ordinary people who could never attract the George Clooneys and Angelina Jolies of the world: "This is likely part of the reason why love evolved: to bond us for cooperative child rearing, but also to assist us in choosing, so that we don't waste time and energy falling for someone who is unattainable."

Here's my suggested rewrite: "This is likely part of the reason love became widespread. Our ancestors, whose genetic makeup allowed them to experience love, gained advantages from it: bonding for cooperative child rearing and help in choosing, so they didn't waste time and energy falling for someone who was unattainable. All that made them better able to produce


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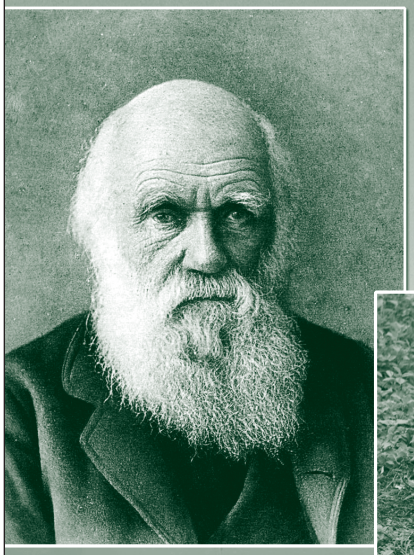

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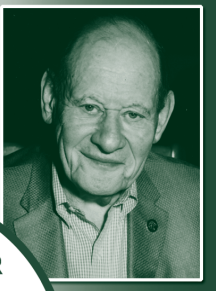

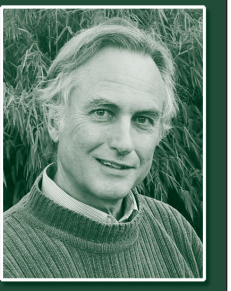

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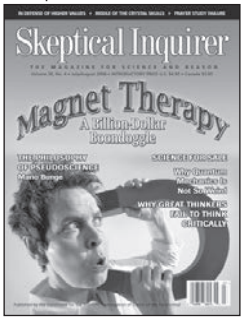


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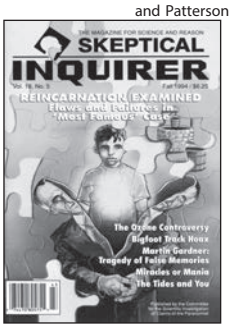


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## Search for Intelligent Life: Reassessing SETI

The article, "SETI Requires a Skeptical Reappraisal," by Peter Schenkel, and three responses by astronomers Jill Tarter, David Morrison, and David Darling that appeared in our May/June 2006 issue brought, as expected, a large reader reaction. Here is a sampling.

—Editor

Regarding Peter Schenkel's "Skeptical Reappraisal" of SETI, a few corrective historical notes may be helpful.

Schenkel writes that Frank Drake, Carl Sagan, and other SETI pioneers estimated that "a million advanced civilizations probably exist in the galaxy." It is true that one can find isolated quotations to that effect in the SETI literature, although for some reason, Schenkel cites none at all. But this view was characteristic neither of Drake nor Sagan, nor of the SETI community as a whole. Their habit was to quote a wide range of values, from a million communicative worlds down to two or three, noting that the outcome depended on which data one plugged into the Drake equation.

The most sensitive term of the equation turned out to be average life span of civilizations: if the median life span were long, there might be many civilizations at a given time; if it were short, we might indeed be alone. As we can hardly expect to know the average life spans of civilizations until we have access to some sort of galactic history book, they cautioned, all such estimates remained speculative, even if we happened to be right about every other parameter. This was responsible science, not starry-eyed romanticism.

Schenkel describes the Drake equation as "incomplete" and urges that it be revised, but he never explains what he thinks is missing from it. If one accepts, say, his assertion that the earth is more unusual than had been thought—not that this position, based largely on post hoc reasoning, is particularly persuasive—all one needs to do is to alter the term in the equation which quantifies the fraction of all planets deemed "earthlike."

Researchers in the field have been wrestling with such matters for decades without finding it necessary to declare their tools inadequate to the task.

Schenkel makes much of the fact that no extrasolar planets resembling the earth have yet been found. But he neglects to mention that the detection techniques employed to date in almost all such searches are mass-dependent—i.e., they can readily detect Jupiters but are virtually blind to Earths. To reason that they reveal an absence of Earths is like dragging a net with a foot-square mesh through the seas and concluding from the resulting evidence that all fish are at least a foot long.

Because we know so little about extraterrestrial life, SETI has long constituted a kind of screen onto which we risk projecting our predispositions. Schenkel, for his part, once believed that our world, "beset by problems," could solve them by consulting "a civilization more advanced than ours"—a notion that certainly qualifies as romantic and optimistic, inasmuch as we have little idea of what we might actually learn from such contact.

Now, he maintains that we need to "demystify" SETI by correcting its "early optimistic estimates," and he takes it upon himself to pardon Drake and Sagan for putative lapses that he condescendingly characterizes as "understandable and profoundly human." But the "optimistic estimates" he decries were never more than part of an ongoing dialog during which Drake, Sagan, and their colleagues remained, in the main, alert to the very hazards that Schenkel has now discovered. They justify neither revising the tools of the trade nor rewriting its history.

Timothy Ferris
University of California, Berkeley
Rocky Hill Observatory
Glen Ellen, California

Peter Schenkel's article on SETI was thoughtful, but it resurrected one poor argument against ET visitation: if I were an alien, I'd behave thusly; since we haven't caught them behaving thusly, they aren't around. But their behavior might not be based on determinants comparable to ours.

ET visitors would have an advanced technology, perhaps old enough to have surpassed our own by several orders of magnitude. They live in the same physical universe, but actually knowing just how mass deforms spacetime or the ultimate nature of electromagnetism and gravity might enable them to manipulate or bypass universal constants. It could certainly make their experiences, and interrelated values, interests, and priorities, very different from ours.

Elephants and cetaceans seem to use complicated verbal communications. We haven't been able to decipher them (or even perceive their subsonic and ultrasonic extremes very well), despite these large-brained mammals' sharing some of our environment and much of our genome. ET's might have even less in common with us. We shouldn't be surprised if alien approaches turn out to be—well, alien.

Jon Hauxwell
Hays, Kansas

Peter Schenkel's "realistic and sober view" of SETI is interesting and thought-provoking, but overly pessimistic. His view reminds me of the similarly negative view intelligent-design creationists hold toward prebiotic chemistry. And for the same reason: both Schenkel and the creationists are stuck in the present, implying that if scientists haven't succeeded by now (either discovering extraterrestrial intelligence or creating life in a test tube), it's unlikely they ever will.

Schenkel appears to be pessimistically pooh-poohing the possibility that future advances in science and technology will open new, productive, rewarding avenues of research that may lead to ultimate success. But historically, such success has been the norm. (Just think how the development of X-ray technology revolutionized medical research.) Compared to most other fields of science, SETI and prebiotic chemistry are still in their infancy. (Both, coincidentally, were "born" in the 1950s.) Both have yet to achieve their ultimate goals, and both may have a long way to

go. But I prefer to think their glasses are half full, not half empty.

Rick Emmer
Bay Village, Ohio

I read with interest the viewpoints on SETI you published. Being that I'm inclined to agree with Enrico Fermi on the existence of extraterrestrial intelligence, you would think I'd be against the SETI program, but I am not. Like football or mountain climbing, the exercise is worth pursuing for its own sake. Even if it yields no positive result, the pleasure of participating and the skills acquired to do so are sufficiently fulfilling to make it worth the while. And if it should be successful, it will only go to prove skeptics like me wrong.

In the various arguments pro and con, however, one very important one was left out. It may be that intelligent species arise rather more frequently than they appear to, simply because they are such transient phenomena. By the time a species acquires the requisite skills to engage in interstellar communication or transport, it has also acquired the ability to render itself extinct. On the geological time scale, this present efflorescence of supposedly intelligent beings here on Earth may turn out to be little more than a wink. Maybe there is indeed a god and she has winked more than once.

Bob Mitchell
Victoria, British Columbia
Canada

I have read with great interest your latest issue, especially the articles on SETI. Paraphrasing Ghandi's famous answer to the question about Western civilization, I could not refrain from thinking, with the U.S.'s geopolitics and Islam's smashing of humane ideas worldwide in mind, that an attempt to locate terrestrial intelligence might be more necessary and fruitful than the otherwise interesting and worthwhile search for extraterrestrial intelligence. And probably just as futile.

Frits Schjøtt, M.D.
Svendborg
Denmark

Your May/June 2006 issue highlighted the controversies surrounding the promise and follies of the SETI paradigm. To weigh in on the side of the rare-earth skeptics, may I remind the readership of a thought experiment that really makes the universe seem barren.

The idea in question is the von Neumann Machine, named for the scientist who gave it intellectual birth. Succinctly put, this is the hypothesis that supposes that given a fecund universe that produces intelligence on every third planet, enough civilizations will have produced von Neumann Machines for interstellar exploration. These devices would be so sophisticated that they would not only cruise space with the prowess of sapient life forms, they could even chow down on raw materials along the way and beget replicas of themselves to further the great mission. The ultimate point of the experiment is that we should have run into them or their remains long ago. We haven't, that's obvious. So just maybe the universe is stony, inhospitable soil for intelligent life. Which, if nothing else, might just suggest that we should value the only known intelligent beings around us just a little more. But since that cuts into a lot of tribalist and political fun and games, it's an uphill battle for that pipe dream.

J. Wroblewski
British Columbia
Canada

I was glad to see Peter Schenkel's hard-minded new look at the SETI program. He describes many reasons why the possibility of intelligent life elsewhere in the universe is much less than many have believed. He rightly points out the length of time, over four billion years, that it took for intelligent life to evolve on Earth.

However, by succumbing to a human/religious-centered view of life, he misses another central reason for skepticism on this issue. He seems to assume that, once established, intelligent life is here to stay. I submit this is highly unlikely. In the 4.6 billion years of the earth's existence, intelligent life, in a form that might be detected by SETI, has existed for about 10,000 years. If we are really lucky, it might exist for another 10,000 years, an imperceptible blip in cosmological time.

William B. Davis
Vancouver, British
Columbia
Canada

Thanks for the four views on the prospects of success with SETI. Unfortunately, what was most clear to me was the arrogance of the view that success is based on the efforts humans exert. Even David Darling's view that our galactic elders may be wise enough to avoid us is based on them overcoming human tendencies that are demonstrated when humans encounter each other. If a skeptical person asks the question, "Is anyone there?" the answer is: probably. The next question is why they have not found us. For 6,000 years, humans have been visible as they marked the planet. In the last hundred years, humans have gone from simple flight to deploying machines on the surface of a neighboring planet. A generation before that, humans launched a couple of crafts that we have no control over, the Voyagers, which even carry gold emblems that tell how to get to Earth. Who imagines that other intelligent beings would somehow leap to a super-controlled exploration of space? In less than another hundred years, humans will have sophisticated interferometers that will at least suggest there may be life on one planet or another.

Should any other intelligent organisms have seen signs of life here, surely they would have launched a craft to come look. There is no reason to imagine such other beings would conclude the smartest choice is not to explore. Maybe the crafts would take two hundred years to get here. No one alive when the craft launched would be alive when it arrived and sent back a message that life exists in abundance on our planet. Such explorers would be called heroic adventurers. Their actions would be second-guessed long after it was too late.

The SETI question is not why have we not found a glimmer of other intelligence. The question is, when will they find us and how primitive will the craft be that suddenly appears in orbit over our planet?

James Smith
Erie, Pennsylvania

The prospect of sitting down for coffee with ET is certainly exciting, but I won't make reservations just yet. I think it is more realistic to search for the chemicals of life first and the signals of life second. Even with the most optimistic view of a similarity in intelligence and technology between ourselves and an exo-race, the successful reception of signals has many constraints.

Finding some of the chemical byproducts of life in the gases surrounding another planet would give us a focus for SETI. Within a few years of finding life in this way, our instruments might be able to specify that life had reached the level of being able to actively manipulate the environment. At this point in SETI, it might be reasonable to send a directed signal and focus for reception of signals over a wide sweep of various parameters.

Rev. Martin Buote
New Bedford,
Massachusetts

Energy considerations doom interplanetary travel as well as SETI. Peter Schenkel repeats the nonsense that ". . . in 200 or 300 years, maybe even earlier, we are likely to master low 'c' velocities, and once we reach them our civilization will send manned exploratory expeditions to the nearest stars." They will never get off the earth's ground, because they have to satisfy the kinetic-energy equation. Although it is simple enough—kinetic energy equals one-half the mass times the velocity squared—it is sufficient to trigger evasive maneuvers on the part of UFO enthusiasts (and, sadly, many readers of S.I.).

For a starship, a minimum weight is 200 metric tons (the numerical basis is given in my book, Are You Conscious, and Can You Prove It? (iUniverse, 2003). After all, it has to carry its own fuel. (Surprise!)

Energy requirements also explain the failure of SETI, but for a different reason. As George W. Swenson Jr. beautifully explained in the July 2000 Scientific American, a 100-light-year reach requires a transmitter power that is ". . . more than 7,000 times the total electricity-generating capacity of the U.S." A 60-trillion-watt transmitter will do for a planet that is ten light-years away. The laws of physics and chemistry are the same everywhere in the universe.

It is foolish of Schenkel, and others like him, to dream of " . . .civilizations tens of thousands or millions of years in our advance. . . ." None of them will stop their Iraq wars and escapades to broadcast a 60-trillion-watt signal towards an unknown "civilization" and wait twenty years for an answer. We wouldn't do it. Why should we expect them to be different?

Our message to SETI people should be: keep listening but don't expect to ever hear anything intelligent. The message to UFO watchers is: there is not the slightest chance that a starship will ever make it to Earth; but if it does, after traveling for a hundred years, the crew would be most appreciative of a cup of coffee and a hot bath.

Sid Deutsch
Sarasota, Florida

I was glad to see Peter Schenkel's "SETI Requires a Skeptical Reappraisal." What bothers me about SETI [the institute] is the Pollyanna-ish optimism found in its publications and on its Web site. Any organization that aims to further scientific discovery should have a frank approach to its subject matter. Rather than disagreeing with the book Rare Earth, SETI needs to embrace the book and accept that its conclusions could indeed be, in the main, correct. SETI does itself a huge disservice by promoting the notion that discovery of extraterrestrial intelligence might be just around the corner.

Should SETI's work continue? Absolutely. But its need to inform its supporters that finding that telltale radio transmission will likely involve a long, frustrating slog, perhaps taking a century or more, and that it might never bear fruit. It also must point out the many hundreds of obstacles between the formation of the first cells on a planet and the point at which the individuals on that planet switch on their first radio transmitter.

John Burgeson
Stratford, Connecticut

SETI is searching for either: accidental contact from electromagnetic pollution (EMP), or deliberate contact. EMP may be a unique aspect of our technologies. Other societies may produce a large amount of EMP early on, only to reduce it later. The likelihood that our brief period of listening would coincide with a narrow band of alien EMP is very low.

Perhaps we have not been deliberately contacted by alien intelligence because no compelling reasons exist. There is no way we can contribute to their understanding of the universe.

Michael Ferro
Baton Rouge, Louisiana

Why has SETI failed to find evidence of other technological civilizations? Maybe civilization is like a video game, and you have to get through one challenge before you can go on to the next level, and so far, we are the only ones who got past the Cuban missile crisis! Now the question is whether we will get past the global-warming crisis.

James Kalat
Department of
Psychology
North Carolina State
University
Raleigh, North Carolina

Peter Schenkel responds:

SETI is a fascinating topic, stirring man's heart and imagination. The fact that my article, "SETI Requires a Skeptical Reappraisal," caused unusual interest and that SI is receiving many comments, some agreeing with my views, others refuting them, proves it, and I am glad about it. Because it shows that I touched a sensitive chord of this thrilling issue and that the time for a sober discussion and evaluation has arrived.

I cannot possibly respond to all critical points of view, but I must say this to Jill Tarter and Timothy Ferris. Why try now to downplay or deny the excessive early optimism regarding the number of extraterrestrial civilizations? Sagan wrote, "There are a million technical civilizations in the Galaxy. . . . The distance to the nearest one is only a few hundred light years" (Communication with Extraterrestrial Intelligence [1973], p. 166). Drake wrote, ". . . there are between one thousand and one hundred million advanced civilizations in the Milky Way" (Is Anyone Out There [1992], p. 62).

As to my suggestion that in view of new insights and discoveries, the Drake formula requires a reevaluation, my references to the many points made in Rare Earth give an inkling of what I mean. The irrefutable fact that it took four billion years for nature to evolve our enormously complex biological (intelligent) makeup, mandates that rethinking. Frank Drake would do SETI a favor by bringing his formula up to date. There was Ozma I and II and Pioneer I and II—why not having a Drake formula II?

With regard to the longevity of advanced extraterrestrial civilizations, I disagree with the pessimistic views. In spite of all our predicaments, L, that is, lon-

gevity, may be estimated to be infinitely long. Humankind is on the way to prove it; there is reason to think that it will survive its primitive development stage.

Scientists engaged in SETI activities must be enthusiastic and optimistic about what they are doing, otherwise funding may dry out. I applaud and support them, but let us stop the too-euphoric assessments and formulate realistic estimates and contact scenarios. Those who refuse to accept this necessity confirm the old adage: People (and unfortunately, also renowned scientists) who refuse to admit that they were mistaken are a rare species.

David Morrison responds:

It is interesting to see the SETI dialog stimulated by the four articles in SI. Many people have opinions about the value of SETI, and particularly the probability of success with current microwave and optical searches.

Timothy Ferris provides a masterful critique of Schenkel's article, based on a thorough understanding of SETI history. The other eleven letters, in contrast, are primarily expressions of opinion, telling us as much about the state of mind of the authors as the expectations of current SETI searches.

Hauxwell, Wroblewski, Smith, Deutsch, and Ferro all comment on some form of the Fermi paradox (If the universe is full of intelligent aliens, why aren't they here?). To readers who are interested in this topic, I recommend Stephen Webb's book Where Is Everybody? Fifty Solutions to the Fermi Paradox. Davis, Mitchel, Ferro, and Kalat, as well as Ferris, note the key issue of the lifetime of a transmitting technological civilization. This is the critical unknown in the Drake equation, neatly summarized in the license plate on Frank Drake's car: N=L (the number of technical civilizations in our Galaxy is approximately the average lifetime in years).

I am not associated with any SETI searches, but I am impressed with the many thoughtful resources available on this topic, from the popular (Sharing the Universe, by Seth Shostak) to the technical (SETI 2020, edited by R.D. Ekers et al.). Unlike Burgeson, I also recommend the SETI Institute Web page (www.seti.org). Search sensitivity continues to grow with Moore's law, and the bottom line stated by Phillip Morrison nearly a half century ago still remains: If we don't look, we won't find anything!

## Common Sense and Intelligent Design

Scott O. Lilienfeld's article, "Why Scientists Shouldn't Be Surprised by the Popularity of Intelligent Design" (May/June 2006), was insightful, yet it told only half the story. Granted that "common-sense" assumptions, with all of their limitations, are partially to blame for adherence to ID. Yet a lack of immediate consequences for belief in ID creates a vacuum! That is, nonscientists who argue for ID have only their own cognitive dissonances with which to contend. And discussions with peers are likely to result in mutual reinforcement.

Yet scientists enjoy immediate feedback from their colleagues, including data from the literature supporting evolutionary theory. Whereas overt endorsement of ID by a scientist is likely to be followed by a plethora of counterarguments, citations of relevant studies, and indignation by the (scientific) community. These consequences serve both as punishment and strong motivation for "getting one's facts straight." And ad hominem arguments are quickly detected and rejected by scientists.

William F. Vitulli
Professor Emeritus of Psychology
University of South Alabama
Mobile, Alabama

Scott Lilienfeld makes the point that common sense is not a good guide to understanding the natural world. As Einstein put it, "Common sense is nothing more than a deposit of prejudices laid down by the mind before you reach eighteen" (Mackay, Allen L. 1991. A Dictionary of Scientific Quotations. Bristol, U.K.: Adam Hilger, Ltd.) But the disjunction between the scientific community and the general public has a still more basic cause. Common sense is highly variable, because it is based on personal experience. The common sense of a New Guinea highlander would not serve him well, for example, in crossing a Manhattan street. Scientists absorb as "common sense" the properties of nature with which they have become familiar, and should not be surprised when others do not see the world their way. Most people still believe that it takes a constant force to keep a body moving at constant speed, in spite of the commonsensical application of Newton's laws that is second nature to the physicist or engineer. Hence, appeals to common sense will not help convince the general public of a scientific fact that it finds counterintuitive.

As much as Americans like to rebel against authority, it is important to persuade them that the long years smart people spend studying a subject does give them special insights that are more trustworthy than "common sense." Such persuasion, of course, involves education—a painful but necessary process.

Lawrence S. Lerner
Professor Emeritus
College of Natural Sciences and Mathematics
California State University, Long Beach

## Teaching Pigs to Sing

I was delighted with Harriet Hall's article, "Teaching Pigs to Sing: An Experiment in bringing Critical Thinking to the Masses" (May/June 2006). The fable about the Tooth Fairy was upsettingly true. Moving from the supernatural to the natural, from superstition to rationality, from belief to evidence, is complex but an extremely important issue.

I have a suggestion for a step in this direction. It is what I call process education, or more simply, learning how to learn.

Our schools emphasize learning content. The teaching approach is essentially: "I know you don't know, but I'm going to tell you," the simple transmission of information. Necessary, but hardly sufficient. The how of learning—critical-thinking skills, problem solving, the steps in logic and rationality—are learnable and teachable. Competent teachers are moving away from simply being experts in their fields toward helping students be better at the processes of learning—to be not only learned but also learners.

With skill and over time, a person can be helped to be more of an inquirer rather than a receptacle, and will realize his or herself that the Tooth Fairy is merely a little myth.

Philip E. Johnson
Tucson, Arizona

I am really enjoying the latest issue of SI. Thank you for providing an excellent mag-

azine.

Two articles (so far!) stand out in my mind. First is Harriet Hall's article, "Teaching Pigs to Sing." Her willingness to try and work with the unwilling to learn is admirable if not questionable. Perhaps she has shown us that the best thing we can do is to serve as role models for others (as skeptics)—hopefully, one day, one of the willingly ignorant will ask, "What do you think?" and then we have the chance to start "singing." Great article, Dr. Hall.

The article by Scott O. Lilienfeld was excellent as well. I think that we are the tortoise in the race with the hare. We are not the fastest runner, but we are slow and steady with regard to just about all things, specifically, in this case, the entire ID/creationism vs. evolution debate. As Lilienfeld points out, there really is no contest, but the "hare" has made a race of it. With the recent decision by Judge John E. Jones III, it appears the tortoise may win this part.

Thanks again for a great magazine.

Stephen Turrisi
Weston, Florida

## Physics and Philosophy

Massimo Pigliucci ("Is Physics Turning into Philosophy," May/June 2006) decries "the anthropic principle," which he defines as "the idea that the universe is fine-tuned to allow for the appearance of life." If, by this definition, he means that some entity did the tuning, he's right that it's closely related to intelligent design. But there are sensible ideas unrelated to religion that also go under the name "the anthropic principle." In particular, if the nature of the universe varies from place to place on very large scales, and if life is possible only in a few of those places, we should not be surprised that we live in such a place. Thus it can appear to us that the universe is fine-tuned for life without the universe as a whole being tuned at all.

Ken Olum
Department of Physics and Astronomy
Tufts University
Medford, Massachusetts

Massimo Pigliucci's article, "Is Physics Turning into Philosophy," has many points of dubious philosophical merit, but I'll stick to a simple but important error in fact. He claims that mathematics is a "branch of logic." While this was widely thought to be true in 1930, it has in fact been mathematically proven to be false.

Alfred North Whitehead and Bertrand Russell, in their monumental treatise, Principia Mathematica, sought to show that all of mathematics could be derived axiomatically using the laws of logic. While they were partially successful, their results were incomplete (self-referential statements were particularly vexing). Given the magnitude of the undertaking, this could hardly be considered a criticism. However, soon after, a young mathematician named Kurt Gödel proved that it must be incomplete. Mathematics, even in simple forms such as arithmetic, is logically incomplete, that is, there are true mathematical statements that cannot be derived from the axioms. Further, such a mathematical system derived from logic could never be proven to be consistent, meaning the assumed axioms would never lead to a logical contradiction.

The power of mathematics to model the real world is not in doubt. But this power does not derive from being a branch of logic, with its inherent limitations. Like physics itself, the proof of mathematical efficacy is in the pudding—predictions tested by observation.

Chris Mack
Austin, Texas

Massimo Pigliucci responds:

I most definitely agree with Ken Olum that there are sensible ideas related to the anthropic principle but unrelated to religion. Unfortunately, these are also rather trivial ideas. If all the anthropic principle says is that the reason the universe appears to be fine-tuned to produce us is because universes that follow very different laws of physics wouldn't produce us, well, one would want to quote the immortal Homer Simpson: Duh.

As for Chris Mack's point, I differ on the interpretation of what Russell and Whitehead, and also Gödel, have actually accomplished. What these people's work shows is that any logical system—including mathematics—is intrinsically incomplete, that is, it cannot be made to stand entirely on its own. We will always need assumptions or axioms that cannot be justified from within the system. This, of course, doesn't mean at all (as it is sometimes claimed) that logic or math are arbitrary constructs, but it does pose interesting limits to the power of deductive logic.

None of this, however, has anything to do with my (not original) claim that math can be thought of as a branch of logic, in the sense that it is entirely based on deductive reasoning and that it follows the same basic structure of formal logic. Indeed, one can read Russell, Whitehead, and Gödel as having shown that math suffers from the same sort of limitations that affect formal logic, which isn't surprising at all if one thinks of the first as a subset of the second.

## Don't Forget Canada!

Neil deGrasse Tyson has every right to be proud of having been chosen to host NOVA scienceNOW (News and Comment, May/June 2006). But we here at Discovery Channel Canada are bemused by his statement that "NOVA scienceNOW is the only show on television that presents cutting-edge science stories in this exciting and fresh magazine format. . . ."

In the United States, maybe. I have been hosting an hour-long, prime-time, magazine-format science show on Discovery Channel Canada since January 1995. One significant difference between our show, called Daily Planet, and Nova scienceNOW is that, rather than being quarterly, we are daily: a new hour every Monday through Friday. In addition, we have spun off weekly versions to the U.S. Science Channel, called Discoveries This Week, and to Discovery Asia, called Connect. We also distribute individual pieces of the show to Latin America and Europe.

The magazine format is not being invented—it is alive and well.

Jay Ingram
Daily Planet
Discovery Channel
Canada
Toronto, Ontario
Canada

## X-rays and Osteoarthritis

In your May/June 2006 "News and Comment" article on the Glucosamine/chondroitin Arthritis Intervention Trial (GAIT), you show an x-ray of arthritic hands with the caption: "Glucosamine supplements may not help arthritic hands such as these." Indeed, the x-ray shows the hands of a person with rheumatoid arthritis, for which glucosamine and chon-

droitin sulfate have never been proposed as therapy. Osteoarthritis, the disease for which these agents are being investigated as treatment, is, largely, a focal degenerative disorder, limited to joint cartilage. In contrast, rheumatoid arthritis is a systemic, multi-organ, inflammatory disease. Osteoarthritis and rheumatoid arthritis are entirely different diseases.

Richard G. Spencer, M.D.
Associate Professor of Medicine
Johns Hopkins Medical School
Baltimore, Maryland

## Whelan Commentary

Elizabeth Whelan, in "Public Health's Credibility Crisis" (Comment and Opinion, May/June 2006), says the "public health community" is losing credibility because it appears to be "promoting politics and ideology over sound science." As evidence, she mentions recent national awards, given to people who were engaged in lawsuits with corporations, rather than primary health matters. I agree with Whelan that public health should deal with public-health matters and that it should practice good science. But I see no conflict between good science and politics. Public-health organizations must address political and ideological issues. They should help form policies and laws.

Scientists have in the past not been very good at advocating—they have felt that perhaps their facts should speak for themselves. But it just doesn't happen. For example, corporations have no motivation to work for the public good. They introduce thousands of chemicals into the environment and our bodies. And a corporation will never quit using a chemical or even test one without pressure. Nothing is easier than to say that no ill effects have been demonstrated from something—if you don't bother to test it! Sometimes, public health requires pressure on powerful social institutions.

As an example of what public-health organizations should promote, Whelan mentions the danger of cigarette smoking. Has she forgotten how many lawsuits over how many years had to take place before the facts about its effect on health finally became public knowledge? And it took a lot of political pressure to get our meat industry regulated, by creation of the FDA. Most public-health issues are not individual lifestyle choices, though often they are treated as such—they really require concerted, unified politicalization. Public-health agencies can operate like social-service workers—mopping up the results of bad social policies. But it's much better to address the problem by helping create the policy, rather than trying to cope with the results of someone else's bad policy. And you have to get down and dirty, political and ideological, to do that.

Myra Jones
Bradenton, Florida

Elizabeth Whelan, president of ACSH, argues among other things that the Harvard School of Public Health was besmirching the whole public-health profession by granting its 2005 Julius Richmond Award to Erin Brockovich. Reading further, I found ad hominem attacks, containing amazing statements such as "there was never any evidence to support Brockovich's claim that chromium 6 [sic] made people sick." The scientific meaning (as opposed to the legal meaning) of such a statement is pretty clear. (Scientific evidence is not "beyond a reasonable doubt," nor can it ever be, which is why science honors skeptics.) Claims of "no evidence at all" are pretty rare in science—as those of us who practice science are well aware. Science (and skepticism) are involved in weighing evidence, while "debunking," itself discredited, is an advocacy role focused on discrediting people—which seems to be what CSICOP is tending to do these days, rather than evaluating claims.

So as a skeptic, I turned one of my skeptical tools (an Internet search engine) on Whelan's claim and then on Whelan herself (merely for contextual understanding of what motivations might explain her commentary's attacks). I found quickly that there is quite a bit of published, peer-reviewed evidence that chromium (VI) is quite serious in its effects on humans and can impact them when breathed or absorbed through the skin via water. Why did Whelan not cite such evidence, as a careful skeptic might, even when disputing that evidence?

I gained some clarity by noting that Whelan is not a "concerned public health worker" but the head of an advocacy organization. Her ACSH Web site (at www.acsh.org) speaks for itself. Rather then "doing science," the ACSH promotes causes. It raises money from corporate sponsors to do so. Not surprisingly, among those corporate sponsors are chemical companies that stand to benefit from her stands against science. Perhaps she is scientifically right on some of her issues, since mere advocacy is not a disqualification from doing science. That is not my point here.

My point is that CSICOP brought a political advocate who is not a practicing scientist into its pages, did not identify her as such, while accepting and helping to promote claims that are not founded in science but merely in advocacy.

Skeptics deserve better.

David P. Reed
Needham, Massachusetts

Elizabeth Whelan responds:

Myra Jones is right that it sometimes takes time for science to recognize the truth, but it has not traditionally been lawsuits that have led to scientific discovery. The dangers of cigarettes were made apparent by epidemiology—the statistical study of the health of different subsets of the population, in this case smokers vs. nonsmokers—not by subsequent decades of lawsuits. Similarly, we should

The letters column is a forum for views on matters raised in previous issues. **Letters should be no more than 225 words.** Due to the volume of letters not all can be published. Address letters to Letters to the Editor, SKEPTICAL INQUIRER. Send by e-mail text (not as an attachment) to letters@csicop.org (include your name and address). Or mail to 944 Deer Drive NE, Albuquerque, NM 87122, or fax to 505-828-2080.

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ber.") According to Wall Street Journal writer Carl Bialik, journalists "often will use dubious numbers to advance that goal [of protecting children] . . . one of the reasons that this is allowed to happen is that there isn't really a natural critic. . . . Nobody really wants to go on the record saying, 'It turns out this really isn't a big problem.'"

## Panicky Laws

Besides needlessly scaring children and the public, there is a danger to this quasi-fabricated, scare-of-the-week reportage: misleading news stories influence lawmakers, who in turn react with genuine (and voter-friendly) moral outrage. Because nearly any measure intended (or claimed) to protect children will be popular and largely unopposed, politicians trip over themselves in the rush to endorse new laws that "protect the children."

Politicians, child advocates, and journalists denounce current sex offender laws as ineffective and flawed, yet are rarely able to articulate exactly why new laws are needed. Instead, they cite each news story about a kidnapped child or Web predator as proof that more laws are needed, as if sex crimes would cease if only the penalties were harsher, or enough people were monitored. Yet the fact that rare crimes continue to be committed does not necessarily imply that current laws against those crimes are inadequate. By that standard, any law is ineffective if someone violates that law. We don't assume that existing laws against murder are ineffective simply because murders continue to be committed.

In July 2006, teen abduction victim Elizabeth Smart and child advocate John Walsh (whose murdered son Adam spawned America's Most Wanted) were instrumental in helping pass the most extensive national sex offender bill in history. According to Senator Orrin Hatch (R-Utah), the bill's sponsor, Smart's 2002 "abduction by a convicted sex offender" might have been prevented had his bill been law. "I don't want to see others go through what I had to go through," said Smart. "This bill should go through without a thought." Yet bills passed without thought rarely make good laws. In fact, a closer look at the cases of Elizabeth Smart and Adam Walsh demonstrate why sex offender registries do not protect children. Like most people who abduct children, Smart's kidnapper, Brian David Mitchell, was not a convicted sex offender. Nor was Adam Walsh abducted by a sex offender. Apparently unable to find a vocal advocate for a chi ld who had actually been abducted by a convicted sex offender, Hatch used Smart and Walsh to promote an agenda that had nothing to do with the circumstances of their abductions. The two high-profile abductions (neither by sex offenders) were somehow claimed to demonstrate the urgent need for tighter restrictions on sex offenders. Hatch's bill, signed by President Bush on July 27, will likely have little effect in protecting America's children.

The last high-profile government effort to prevent Internet predation occurred in December 2002, when President Bush signed the Dot-Kids Implementation and Efficiency Act into law, creating a special safe Internet "neighborhood" for children. Elliot Noss, president of Internet address registrar Tucows Inc., correctly predicted that the domain had "absolutely zero" chance of being effective. The ".kids.us" domain is now a largely ignored Internet footnote that has done little or nothing to protect children.

## Tragic Misdirection

The issue is not whether children need to be protected; of course they do. The issues are whether the danger to them is great, and whether the measures proposed will ensure their safety. While some efforts—such as longer sentences for repeat offenders—are well-reasoned and likely to be effective, those focused on separating sex offenders from the public are of little value because they are based on a faulty premise. Simply knowing where a released sex offender lives—or is at any given moment—does not ensure that he or she won't be near potential victims. Since relatively few sexual assaults are committed by released sex offenders, the concern over the danger is wildly disproportionate to the real threat. Efforts to protect children are well-intentioned, but legislation should be based on facts and reasoned argument instead of fear in the midst of a national moral panic.

The tragic irony is that the panic over sex offenders distracts the public from the real danger, a far greater threat to children than sexual predators: parental abuse and neglect. The vast majority of crimes against children are committed not by released sex offenders but instead by the victim's own family, church clergy, and family friends. According to a 2003 report by the Department of Human Services, hundreds of thousands of children are abused and neglected each year by their parents and caregivers, and more than 1,500 American children died from that abuse in 2003—most of the victims under four years old. That is more than four children killed per day—not by convicted sexual offenders or Internet predators, but by those entrusted to care for them. According to the National Center for Missing and Exploited Children, "danger to children is greater from someone they or their family knows than from a stranger."

If journalists, child advocates, and lawmakers are serious about wanting to protect children, they should turn from the burning matchbook in front of them to face the blazing forest fire behind them. The resources allocated to tracking ex-felons who are unlikely to re-offend could be much more effectively spent on preventing child abuse in the home and hiring more social workers.

Eventually this predator panic will subside and some new threat will take its place. Expensive, ineffective, and unworkable laws will be left in its wake when the panic passes. And no one is protecting America from that.

## Note

1. For more on this, see my article "Stranger Danger: 'Shocking' TV Test Flawed" at www.mediamythmakers.com/cgi-bin/mediamyth

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